

# Mining

CONGRESS JOURNAL



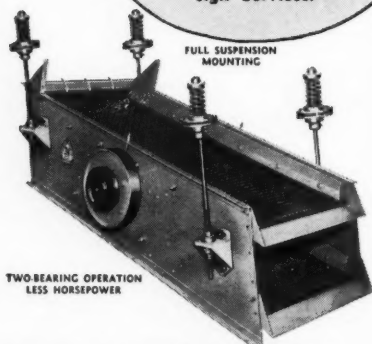
MAY  
1956



# DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

**One Responsibility**

Agitators, Ball-Rod Mills, Classifiers, Conditioners, Crushers, Dryers, Feeders, Filters, Flotation, Jigs, Pumps, Samplers, Screens, Thickeners, Ore Testing and Mill Design Services.



**Save Up to 50% Power Costs  
with DENVER-DILLON  
Vibrating Screens**

- Lower Power Cost with two-bearing operation and suspended assembly.
- Positive rapid vibration through "floating circle" action.
- Low operating cost.
- Rugged, simple construction.
- Sizes to 6' x 14', single or multiple decks.

For complete information, WRITE FOR BULLETIN NO. 53-B13.



## DENVER FORCED FEED JAW CRUSHERS

**Assure Long Life in Heavy Duty Operation**

### 1. ANTI-FRICTION BUMPER BEARINGS

Pitman bearing troubles—the most serious problem with bronze bearing crushers—have been eliminated by using oversize, heavy-duty roller bearings for the Pitmans on Denver type "H" Jaw Crushers. Prices are comparable to all-bronze-bearing crushers.

Two types of crushers are available—type "H" has anti-friction bumper bearings and bronze side bearings. Type "J" has anti-friction bearings for bumper and side bearings. Available in sizes 5" x 6" to 36" x 48".

### 2. LONG-LASTING JAW PLATES

Genuine 13-14% manganese cast steel is used for jaw and cheek plates on Denver Jaw Crushers. Jaw plates are reversible so that service life is greatly increased and replacement costs cut.

### 3. HIGH STRENGTH FRAME

The steel frame of Denver Jaw Crushers is heavily reinforced to withstand more than the most severe service it will meet in its size reduction range.

For complete information about Denver Jaw Crushers, WRITE FOR BULLETIN No. C12-B12.

*"The firm that makes its friends happier, healthier and wealthier"*

**DECO**

ENGINEER



## DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado  
DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO  
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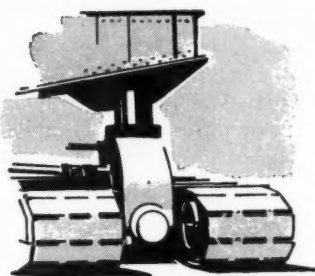
*How to cut  
mining  
maintenance  
costs*



**1** Reduce oil inventories

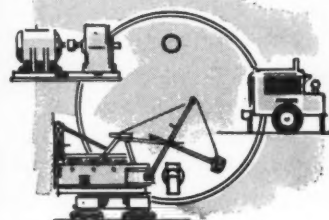
STANOIL Industrial Oil can be used in so many places that you can reduce inventories of special oils. Add to this the economy of simplified storage and handling. Use STANOIL Industrial Oil in electric motors, air compressors, fans, blowers, transmission and clutch lubrication, and hydraulic systems. Use STANOIL to lubricate bearings either in direct application or in oil circulating systems.

**Use STANOIL Industrial Oil—  
save these three ways**



**2** Get better lubrication

Special solvent-refining techniques plus the blending in of exclusive additives make STANOIL the finest industrial oil. STANOIL resists chemical change . . . lubricates effectively and completely over a wide temperature range . . . cuts wear. It protects oil systems from troubles due to carbon deposits, corrosion and emulsion. It stands up under heavy and repeated shock loads. STANOIL has high oxidation stability and extremely low carbon forming tendency.



**3** Prevent application mistakes

When there is only one lubricant, there can't be any chance of the wrong one being used. With STANOIL, errors in application that would result in breakdowns are eliminated; equipment stays in service longer; maintenance is easier; overhauls go more smoothly and equipment is back in service faster.

Get more information about STANOIL Industrial Oil.  
Call your Standard Oil industrial lubrication specialist.

He is experienced in mine lubrication. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



**STANDARD OIL COMPANY**  
(Indiana)

**Quick Facts About**

**STANOIL Industrial Oil**

- **Stability**—STANOIL's antioxidant gives oil resistance to chemical change, minimizes deposits.
- **Rust Prevention**—The inhibitor in STANOIL "plates out" on metal surfaces, prevents corrosion.
- **Cold Starts**—STANOIL has low pour point. Flows freely from cold start. No need for costly warm-ups.
- **Resists Effects of Temperature Change**—STANOIL has high viscosity index, resists temperature change.
- **Has Excellent Demulsibility**—STANOIL is refined to eliminate emulsion problems, contains additive to minimize foaming.

# **with COLMOL<sup>®</sup>**

## **an average production of 25 tons per payroll man**

**Peck's Run Coal Company**, Upshur County, West Virginia, reports after two years' experience with their Colmol:

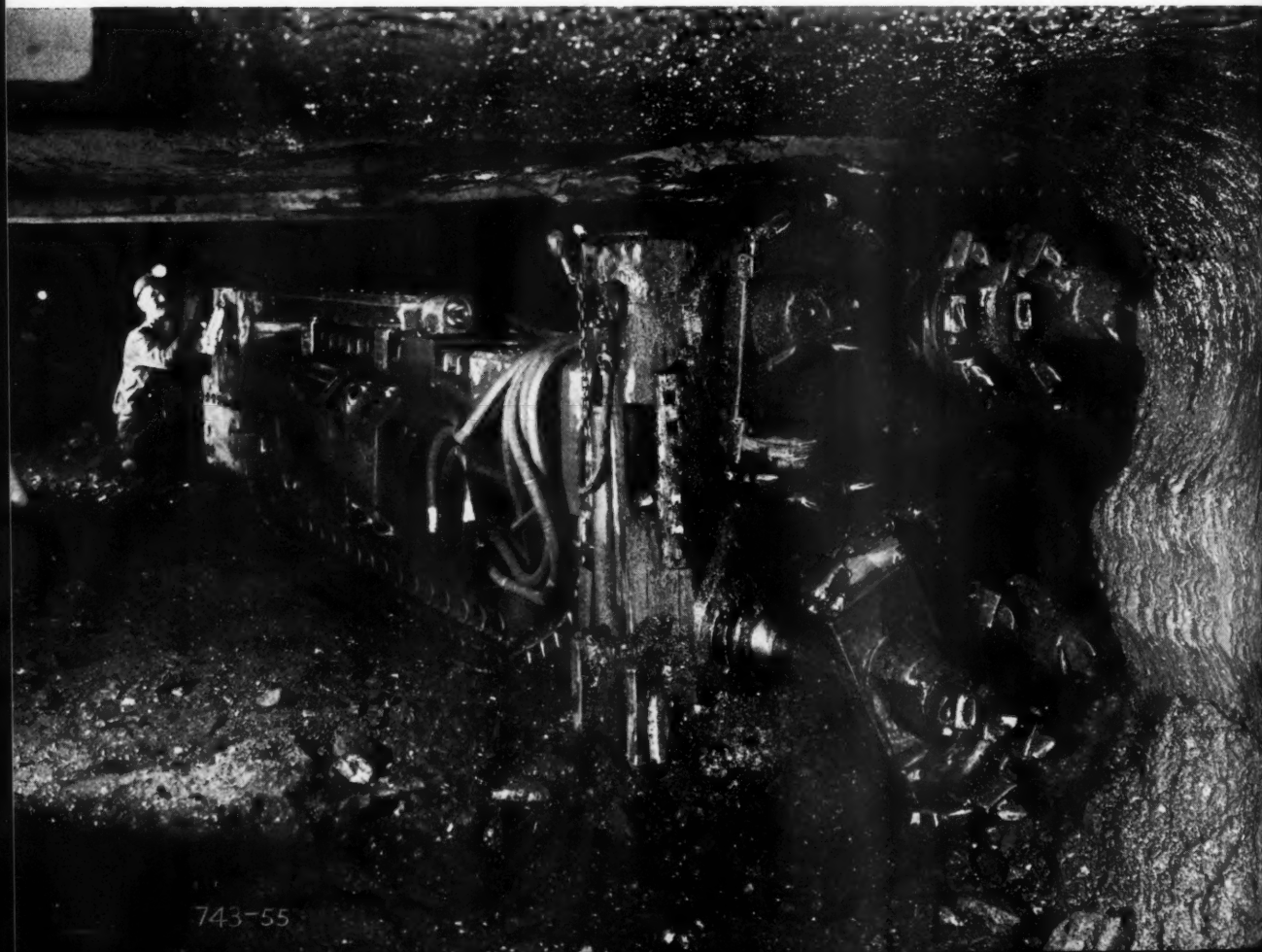
High average shift tonnages mined at lower cost; 25 tons per man on the payroll.

- Roof support costs were reduced and safety was increased, because no explosives are used.
- Bit costs are very reasonable, even though coal has a medium-hard structure, and sulphur balls and pyrite lenses occur frequently.

- Coal quality is better than obtained by conventional mining methods; ash reduced from 8.7% to 7.0% and sulphur reduced from 3.0% to 2.4%.

Redstone seam, mined since 1917, ranges in height from 50" to 72"; mainly 54" to 68". High ash and high sulphur layers persist throughout the property immediately adjacent to the top and bottom of the seam. Strict supervision of mining keeps these operations in the desirable, narrower coal where the seam is good.

**A Jeffrey 76-B Colmol**, with a mining range of 50½" to 66", working at Peck's Run.





746-55

**A 30' Jeffrey 52-B belt conveyor at Peck's Run.**

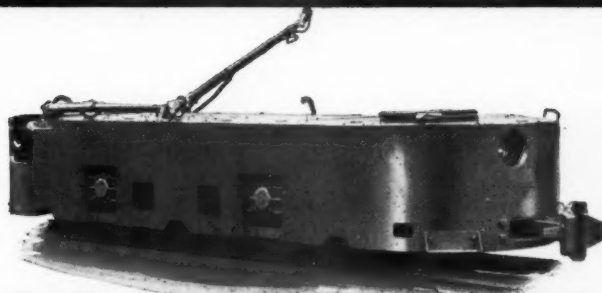
In solid mining, 3 entries are driven on 60' centers, with a 30' Jeffrey belt conveyor in the center entry. Single panels are developed to left and right at a 60° angle, limited to 5 blocks in depth, 80' wide by 90' deep, so the longest haul to the belt is 450'. Places are driven two widths of the Colmol, or 19' wide.

The resulting pillars, 62' by 72', are split through by driving two widths of the Colmol. The remaining two stumps are removed by single width advances of the Colmol, leaving small triangular pillars, which make adequate roof supports, until falls are made. One block gives about 870 tons.

Present operation is three shifts, two of which are full production of about 450 tons average. The third shift mines 100 to 300 tons, since it is principally engaged in inspection, maintenance and lubrication of equipment, supplying and advancing the belt line. They also finish up places that will permit the Colmol to start the next production shift to better advantage.

The three shifts total from 1000 to 1200 tons per day, the entire output of the mine. Single shift production in excess of 600 tons has been obtained with this Jeffrey unit.

**A 15-ton Jeffrey trolley locomotive** hauls the coal to the tipple in 8-ton, 8-wheel mine cars for picking, crushing, sizing, and loading into railroad cars. A cleaning plant is now under construction at Peck's Run Coal Company.



The Jeffrey Manufacturing Company, Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Harlan, Pittsburgh, Salt Lake City.



**JEFFREY**

MINING • CONVEYING • PROCESSING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING



# Production Up 25% Fuel Costs cut 30%

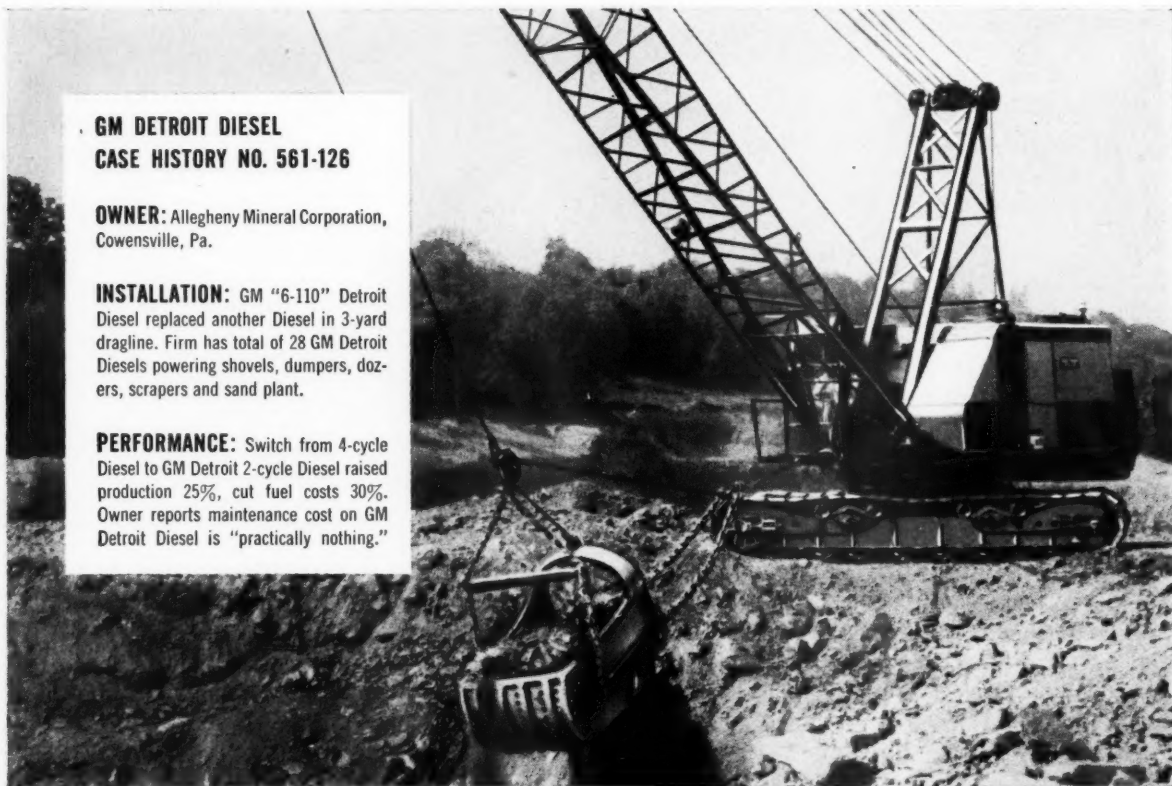
*Since He Switched to GM Detroit Diesel Power*

## GM DETROIT DIESEL CASE HISTORY NO. 561-126

**OWNER:** Allegheny Mineral Corporation,  
Cowensville, Pa.

**INSTALLATION:** GM "6-110" Detroit Diesel replaced another Diesel in 3-yard dragline. Firm has total of 28 GM Detroit Diesels powering shovels, dumpers, dozers, scrapers and sand plant.

**PERFORMANCE:** Switch from 4-cycle Diesel to GM Detroit 2-cycle Diesel raised production 25%, cut fuel costs 30%. Owner reports maintenance cost on GM Detroit Diesel is "practically nothing."



**P**RODUCTION UP, fuel costs down, maintenance expense slashed—that's what hundreds of operators report after their switch to General Motors Detroit Diesel power.

And the reason is clear.

They get extra production with a GM Detroit Diesel because a 2-cycle engine delivers twice as many piston power strokes per crankshaft revolution as a 4-cycle engine.

They pile up worth-while records of fuel saving as evidenced by this Pennsylvania user's report—so typical of others who are profiting by switching to Detroit Diesel engines.

And one reason maintenance costs drop is that GM Detroit Diesel parts cost less. For example, valves, pistons, rings, liners, bearings and other replaceable parts cost less than for most other Diesels.

But get the full story on GM Detroit Diesel power from your GM Detroit Diesel distributor or dealer. Call him today—or write direct.

## JIMMY DIESEL'S MAINTENANCE TIPS

Your GM Detroit Diesel is built for a lifetime of hard work. But you'll get better service from your engine if you have your GM Detroit Diesel distributor or dealer set up a preventive maintenance program for you. Call him today and remember—Preventive Maintenance Doesn't Cost, It Pays.



## DETROIT DIESEL

Engine Division  
of General Motors  
Detroit 28, Michigan

Single Engines... 90 to 300 H.P. Multiple Units... Up to 898 H.P.

America's Largest Builder of Diesel Engines

MAY, 1956

VOLUME 42 • NUMBER 5

# Mining

## CONGRESS JOURNAL

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FRONT COVER: The New Cornelia Mine of Phelps Dodge Corp. at Ajo, Ariz., looking East. In the circle on the near pit-crest is the "Lookout" building, control center for the radio system, described in the article by J. A. Lentz, beginning on page 34.

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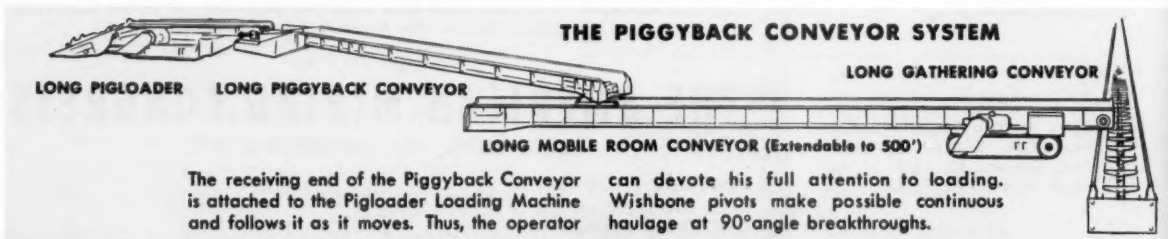


## Up to 75% loading time per shift with PIGGYBACK Continuous Haulage Mining

By providing continuous haulage, the LONG Piggyback\* Conveyor System delivers a steady, constant flow of material outby of the face area. The loading machine never has to wait for transportation—its rated capacity can be utilized throughout the entire loading cycle. As a result, with low-investment, low-maintenance Piggyback Mining, six hours or more loading time per shift is not unusual.

Every day more and more companies are learning that this exclusive LONG development pays off in higher total tonnages, more tons per man, and lower operating costs—regardless of seam height. What's more, the capital investment for the Piggyback System is much lower than for any other mining method. We'll be glad to supply facts and figures—without obligation.

\*Trade Mark



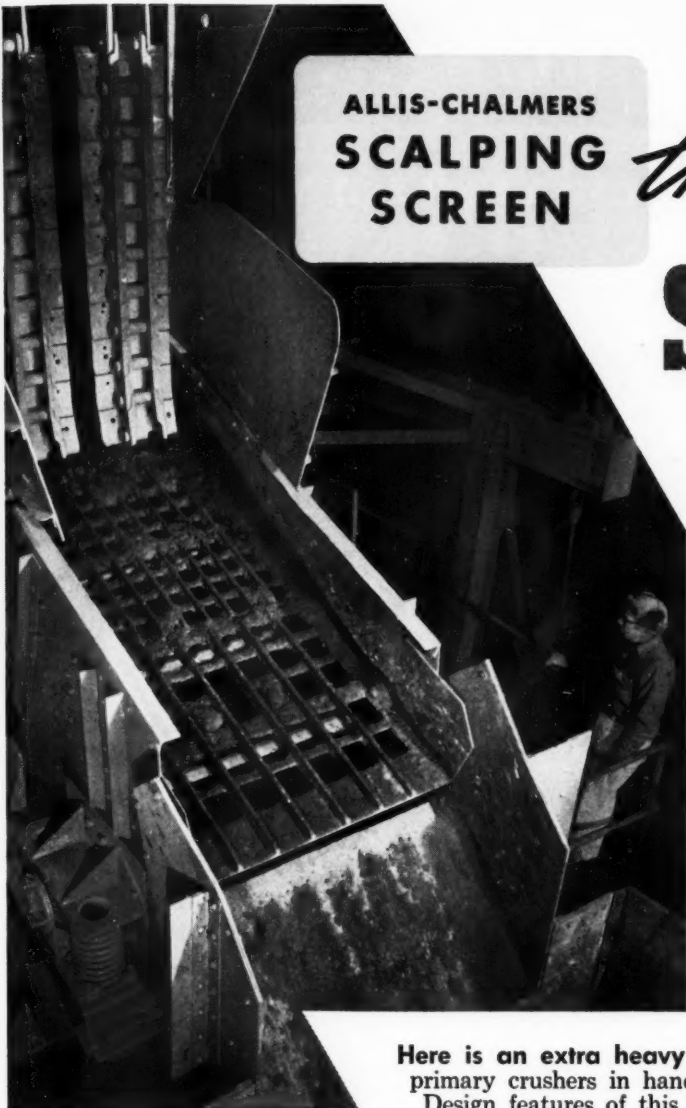
For complete details or a demonstration, write us today!

*The*

**LONG**  
OAK HILL, W. VA.

*Company*





**ALLIS-CHALMERS  
SCALPING  
SCREEN**

# *the* **BIG SCREEN for the BIG JOBS**

- Extra-Large Mechanism
- 12-inch I-Beam Deck Support
- Takes Punishing Loads

Performance proved on  
the Mesabi range . . .  
one of the toughest test-  
ing grounds in the world.

Here is an extra heavy duty screen engineered to team up with primary crushers in handling the toughest job in any mining flow. Design features of this rugged screen include a cartridge-type, oil-lubricated mechanism with giant size bearings and a 12-inch I-beam in channel-constructed top deck support frame. The bearings, largest ever installed in a vibrating screen, are designed for long term service under heavy load conditions. The sturdy channel construction of the screen deck support frame can withstand the impact of single pieces weighing as much as 8000 pounds.

**Reduced Maintenance** — Simplified two-bearing, cartridge-contained mechanism can be pulled out after removing sheave and four bolts. Large size bearings mean extended life, less frequent replacement.

**Vibration Isolation** — Standard design includes multi-unit vibration isolators — two per corner, each with an inner and outer spring arrangement. Vibration to building or structure is isolated even when materials adhere to screen.

A-5051



For complete information, see your A-C representative or write for Bulletin 07B8368. Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

# **ALLIS-CHALMERS**



*Announcing...*

# TWO NEW THOR SINKERS

**for wet or dry operation**



**MODEL 37 THOR SINKER.** In the 45 lb. class, this new all-purpose Thor Sinker makes fast work of drilling holes up to 12 feet deep in soft to medium rock. New features include a renewable bronze bushing in cylinder front bearing and a renewable chuck driver nut. Chuck is press-fitted into chuck driver, a construction permitting replacement of parts subject to wear.

This new Thor Sinker can be used with Thor Sinker Leg or Thor Guide Shell for drifting, especially with carbide bits, and with Thor Raiser for stoping operations.

**MODEL 77 THOR SINKER.** In the 55 lb. class, this new heavy duty Thor Sinker is designed for drilling holes up to 20 feet deep in hardest rock. New features include a yoke type latch retainer which locks in fixed position for safety in pulling steels when used with Thor Sinker Legs. Renewable bronze bushing in cylinder front bearing and a bronze chuck driver nut assure longer wear.

Equals performance of the famous Thor No. 75, heavy duty Sinker. Ask your Thor distributor for a demonstration. Thor Power Tool Company, Aurora, Illinois.

**THOR POWER TOOL COMPANY**

*Branches in all principal cities*

[ Page 8 ]

IN TODAY'S LIGHT FOR THE MINER—

*The dollar you pay for*  
***performance***  
*buys an outstanding value*  
*with* **WHEAT**

When you install WHEAT Electric Cap Lamps you get *continuous, high-level lamp performance*. Year after year, WHEAT gives you more light, dependable light, with less maintenance and at lower cost.

Development of the WHEAT all-metal Automatic Charging Rack with its electronically-controlled, selenium-disc rectification makes possible further savings through fully automatic operation.

*Why not investigate!*

**National Mine  
Service Company**



HAS THE FACILITIES  
—DELIVERS THE GOODS

564 ALCOA BUILDING, PITTSBURGH 19, PA.



**7 PLANTS TO SERVE YOU**

ALL-STATE DIVISION, Logan, W. Va. • ASHLAND DIVISION, Ashland, Ky.  
KY.-VA. DIVISION, Jenkins, Ky. • WHITEMAN DIVISION, Indiana, Pa. • ANTHRACITE DIVISION, Forty Fort, Pa.  
BEMICO DIVISION, Beckley, W. Va. • WESTERN KY. DIVISION, Madisonville, Ky.



# LINK-BELT PRE-BILT MADE NEAR YOU

Built in standard sections  
for 18, 24, 30 and 36-in. belt  
widths...at each of 9 plants

AN unmatched combination of belt conveyor efficiency and economy, Link-Belt PRE-BILT sectional belt conveyors incorporate standard products packaged with standardized sectional truss frames and structural steel supporting bents. They're easy to install...require little or no special engineering on most jobs. And their portability plus easy extension are important aids to flexibility.

PRE-BILT conveyors are manufactured at a Link-Belt plant in your own area to assure prompt delivery. There are also Link-Belt sales offices located throughout the country...equipped to give you prompt, efficient service for all your belt conveyor requirements.

For more information about these conveyors—with drives up to 40 hp and 24 and 42-inch truss depths, write for your copy of Book No. 2579.

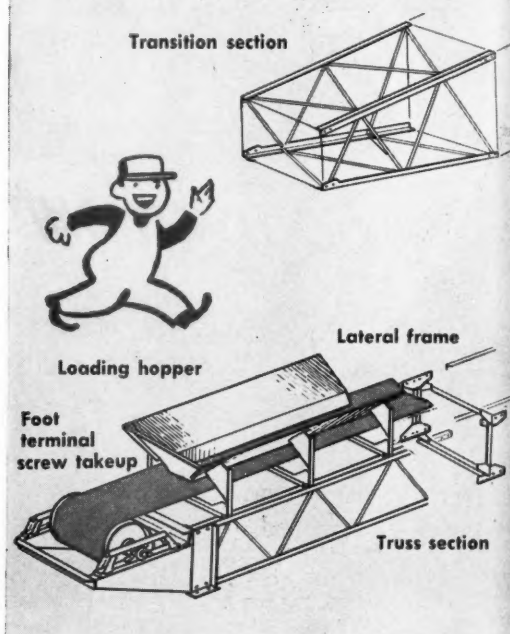


**BELT CONVEYOR EQUIPMENT**

**LINK-BELT COMPANY:** Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

14,110

THESE STANDARD COMPONENTS ARE ALL



AS SIMPLE AS THIS  
FROM SELECTION TO OPERATION —

#### EASY SELECTION

Your Link-Belt representative will help you select the best combination of PRE-BILT sectional belt conveyor components.

#### PROMPT QUOTATIONS

He will prepare a comprehensive and accurate estimate of requirements for installations that permit "on-the-ground" survey.

#### SIMPLIFIED PURCHASE

Parts are standardized, interchangeable, all available from one supplier. Link-Belt representative can furnish all necessary data.

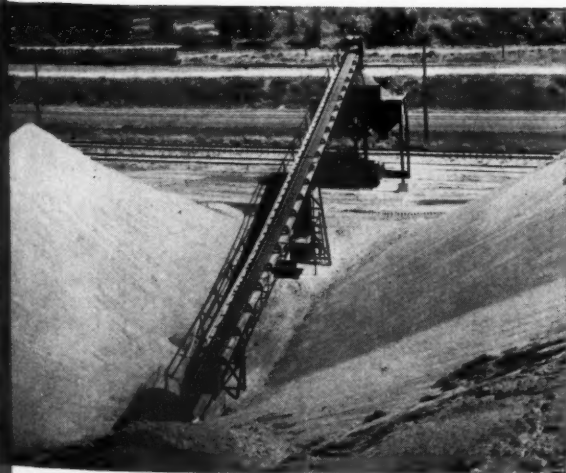
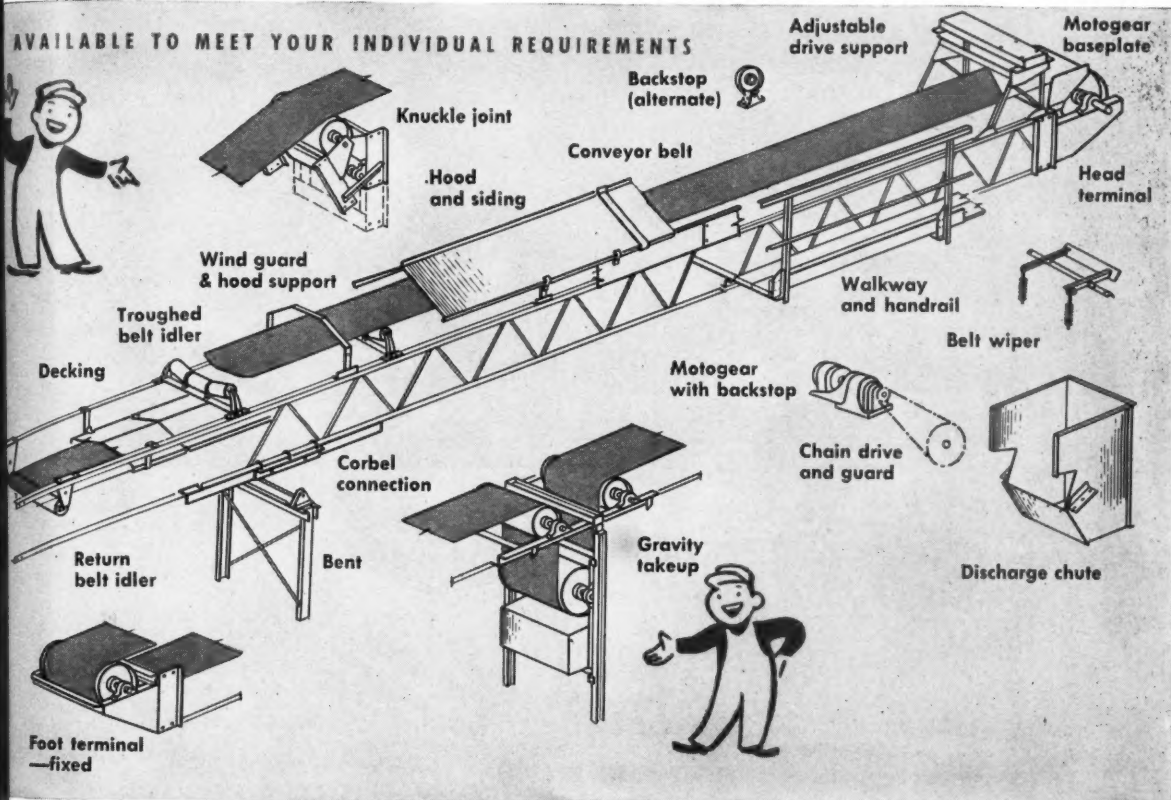
#### QUICK DELIVERY

PRE-BILT conveyors are built at nine strategic locations and are shipped from the plant nearest you.

#### FAST INSTALLATION

Can be readily handled by your own erectors in most cases—due to simple construction and shop-assembled components. Link-Belt can also furnish complete erection service and supervision.

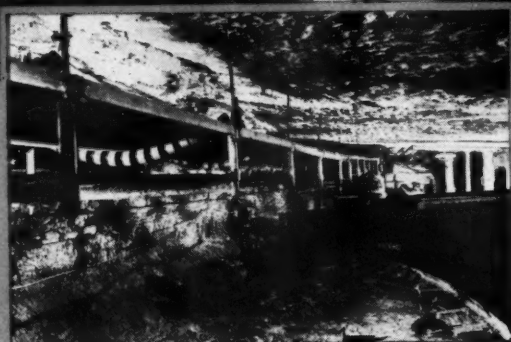
# Sectional Belt Conveyors FOR FAST DELIVERY



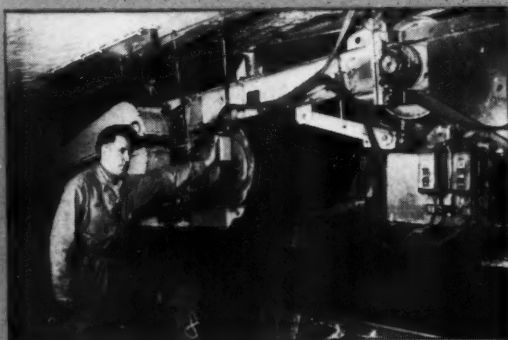
PRE-BILT reclaim belt conveyor delivers sand and gravel from tunnel under stockpile to hopper. System of nine belt conveyors and two radial stackers handles up to 6000 tons per day.



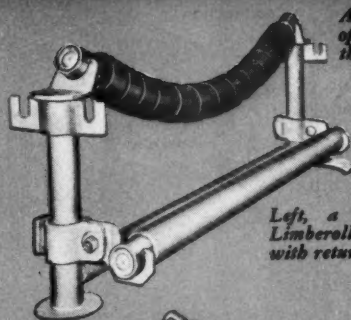
PRE-BILT conveyors can be easily extended to follow mining or disposal operations, as in this system providing low-cost disposal for 1140 long tons per hour of overburden and lean ore.



About 100 ft. of the conveyor sections leading to the drive are installed overhead, held by roof bolts, to clear and discharge into mine cars.



This Limberoller-equipped belt conveyor is powered by a Joy MTB-36 drive (100 HP, 440 volts AC). Standing by the drive unit is the mine's general superintendent, who supervised the conveyor installation.

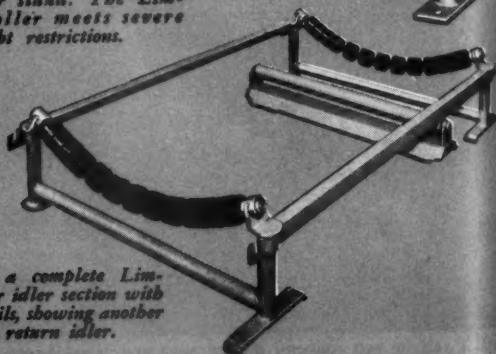


Above, a view of the belt in operation. Note how true the idlers train and run.

Left, a standard-height Limberoller idler stand, with return idler in place.



Right, a low-height impact idler stand. The Limberoller meets severe height restrictions.



Right, a complete Limberoller idler section with side rails, showing another type of return idler.



# This Unique Joy LIMBEROLLER-EQUIPPED BELT CONVEYOR

is saving money  
many ways!

operator says: *"Well pleased"*

This 36" wide, 3000 ft. long Joy Belt Conveyor (illustrated on the left-hand page) is installed in a Virginia mine operating in the Norton seam. The coal averages 42" high.

The new 36" belt is completely equipped with Limberoller idlers. It takes the discharge from three 26" belts and handles the coal to the discharge end with no spillage, and therefore eliminates clean-up men.

Limberoller idlers are an exclusive Joy development ...and the best news for hard, dirty, continuous underground service in many a year. Each idler consists of a series of neoprene discs molded in one piece on a core of flexible steel cable, and there are only two self-lubricated bearings per idler—one at each end, up out of the dirt.

Thousands of Limberollers are in highly successful use today. At this mine, the officials say they're well pleased, both with no spillage and with the open construction of section frames that permits easy inspection. Since starting up the belt in early Autumn, 1955, they've had no trouble, no failures, no maintenance. Production rates are improved, and they expect at least 20% longer belt life, due to the fact of better troughing and reduced shock on the belt by the Limberollers.

There's just one best answer to belt conveyor problems—and that's the Joy Limberoller idler. • Let us work with you. Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Penna. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

Write for FREE Bulletin 72-3



*Consult a Joy Engineer*

WSW 6029-72

NO OTHER CONVEYOR IDLER  
MATCHES THESE ADVANTAGES  
OF THE

**JOY LIMBEROLLER**

- ★ Follows mine bottom, withstands greater misalignment.
- ★ No spillage, centers the load and shapes to it.
- ★ Easy to extend or retract—to handle, store and haul.
- ★ Less time and easier to set up, knock down and move.
- ★ No lubrication needed, no bolts or cover sheets required.
- ★ Fewer idlers required: spaced at least 50% further apart.
- ★ All components can be transported on the belt.
- ★ No worry over which end of conveyor sections goes in first.
- ★ Less friction to start up, only 1/3 as many bearings.
- ★ Only 1/3 as heavy as steel idlers, easy to change.
- ★ Ideal for hard-to-get-at locations—put it in and forget it.
- ★ Less belt wear, longer life.

# JOY

WORLD'S LARGEST MANUFACTURER OF  
UNDERGROUND MINING EQUIPMENT

# 5

# "Euc" ... REAR-DUMPS



**10-Ton**

The Model UD has a  $6\frac{1}{2}$  cu. yd. body and rated payload of 20,000 lbs.—a quarry body with flared sides is available for rock work. Designed for smaller mine, quarry and construction work, this Rear-Dump has a 128 h.p. engine and 10-speed transmission providing a top speed of 36 m.p.h. Drive axle is spring mounted—firs are 11.00 x 24 front with 12.00 x 24 rear duels.



**15-Ton**

There are two models of this capacity "Euc". One has a 10 cu. yd. body, 165 h.p. engine, semi-rigid drive axle and manual steering—the other has a 218 h.p. engine,  $10\frac{1}{2}$  yd. body, spring mounted drive axle and hydraulic steering. The latter model can be equipped with larger tires to increase the rated payload to 18 tons. Both have 5 speed transmissions and 14.00 x 24 tires standard—a quarry body for either model is available.

**22-Ton**

Practically a "standard" on larger quarry, mine and heavy construction projects, the Model TD "Euc" has a 300 h.p. engine, spring mounted drive axle, and 15 yd. body. Tires are 14.00 x 24 front with 18.00 x 25 duels rear. Hydraulic steering is standard, and a quarry body is available. This "Euc" can be equipped with a 10-speed transmission or Torquematic Drive—it's a top performer on the toughest jobs.



**10 to 50 TONS—128 h.p. to 600 h.p.**

## **A Complete Line of Off-highway Haulers**



**34-Ton**

This Twin-Power tandem axle "Euc" has two engines providing a total of 400 or 436 h.p.—each engine drives an axle through a separate Torqmatic Drive. The exhaust heated body has a capacity of 24 yds. Tires are 16.00 x 25 front, with 16.00 x 25 rear duals in tandem. For jobs where large loading equipment is used and big loads must be hauled, the Model FFD has no equal for low cost production and performance.

*for*

### **CONSTRUCTION, MINE, QUARRY and INDUSTRIAL WORK**

Rear-Dump "Eucs" are the outstanding choice for moving heavy excavation on the toughest jobs because they are built exclusively for off-the-highway service. They have the capacity, power and speed to haul big loads faster and at lower cost per ton or yard moved.

The simple, rugged construction of Euclid Rear-Dumps pays off in long life and low maintenance cost. There's less down time for repairs . . . more work-ability. These "Eucs" have engines of 128 to 600 total h.p. . . . single and tandem drive axles . . . standard or quarry type bodies . . . gear transmissions and Torqmatic Drive . . . spring mounted and semi-rigid drive axles . . . top speeds, with full payload, up to 36 m.p.h.

Wherever you see Rear-Dumps in off-highway work, it's almost a sure thing they are "Eucs" because Euclid has been the leader in this field for over 20 years. There are more Rear-Dump "Eucs" in service than all other makes of off-highway haulers combined. Have your Euclid dealer supply helpful data on this complete line of Rear-Dumps and other Euclid earth moving equipment . . . you may find, as hundreds of owners already have found, that *Euclids are your best investment.*



**50-Ton**

Largest Rear-Dump hauler in standard production, the Model LLD Euclid is designed for the biggest, toughest jobs. It has two engines, providing a total of 600 h.p.—each of the spring mounted drive axles is driven through separate Torqmatic Drives. The exhaust heated body has a 32 yd. capacity. All tires are 18.00 x 33. Twin Euclid hoists have ample power to raise the fully loaded body fast for quick, clean dumping.

**Rear-Dump "Eucs" are your best bet**

# **Euclid Equipment**

FOR MOVING EARTH, ROCK, COAL AND ORE

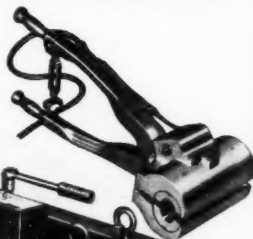




# HERE'S 3-WAY PROTECTION AGAINST PRODUCTION LOSSES



**JOY** Vulcanizers For Repairing Cable



**JOY** Portable Lighting Lines® *String-a-lite*



**JOY** Electrical Connectors



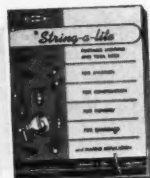
*Yours for the asking*  
**WITHOUT OBLIGATION**



**BULLETIN B56 & B57**  
Provide complete information on JOY Attachable and Molded-to-cable type connectors.

You can't buy better Insurance against "downtime losses" caused by faulted power feeders and lighting lines . . . than JOY electrical connectors, portable lighting lines (String-a-lite) and cable vulcanizers provide. Designed by an organization which has been making this type equipment for Metal Mining needs for almost thirty years, these JOY products can be relied on to provide years of dependable, maintenance-free service.

**ELECTRICAL PLUGS AND RECEPTACLES . . .** More JOY electrical connectors are used in mining operations than all other brands combined. Factory molded as resilient Neoprene rubber insulated units, they can't crack or lose shape when struck hard blows . . . are moisture and dust tight . . . and require no pampering to provide a long life of safe, efficient service. Hundreds of styles and sizes are available for mining needs. So for production's sake, remember JOY when you need electrical connectors . . . Bulletin No. B56 provides details. Ask for your copy.



**BULLETIN No. B52**  
Twelve pages of illustrations and descriptions on JOY portable lighting (String-a-lite) and tool-outlet strings.

**PORTABLE LIGHTING LINES (String-a-lite) . . .** Require no special tools or talents to install or dismantle. Can be quickly lengthened, shortened or moved to meet the exact needs of any working or passage area. Supplied in one-piece factory molded sections of 2 to 10 light outlets that inter-connect through JOY male and female "end-plugs" to make up the complete string. Choice of five socket and two end plug designs. Mating power receptacles also available. Bulletin B52 provides complete details.



**BULLETIN No. B48a**  
Describes and illustrates JOY's complete line of cable vulcanizers, molds and vulcanizing supplies.

**CABLE VULCANIZERS . . .** for rubber, Neoprene, Buna S and thermoplastic jacketed cables. Simple in operation, JOY vulcanizers quickly pay for themselves by making it possible to repair cuts and breaks in vital portable power lines immediately. Two types are available — "Steam" and "Direct Heat." Both are heated electrically with automatic temperature controls. Bulletin B48a describes these vulcanizers in detail and lists molds vs. cable sizes. Ask us for your free copy.



**JOY MANUFACTURING COMPANY**

General Offices: Oliver Building Pittsburgh 22, Penna.  
In Canada: Joy Manufacturing Co., (Canada) Ltd., Galt, Ont.

# JOY

Specialists in Creating Electrical Connectors  
for Mining Applications, Since 1928

CD 356.3





(Courtesy Climax Molybdenum Co.)

## Single blast of Du Pont **"NITRAMON"** breaks 750,000 tons of ore at Climax, Colorado

On October 2, 1955, the Climax Molybdenum Co. brought down an estimated 750,000 tons of ore at its Climax, Col., mine when it collapsed a section of huge arch that had resisted earlier blasting efforts. 81,614 pounds of Du Pont "Nitramon"—the safest blasting agent known—were loaded in three coyote adits.

Climax uses "Nitramon" in mammoth blasts like this because its combination of maximum safety and power is ideal for coyote work. With "Nitramon," crews can safely use electric lighting to speed loading. And they needn't worry about headaches—"Nitramon" contains no nitroglycerin.

"Nitramon" cannot be exploded by shock, friction or rifle bullets. It should be detonated with a special insensitive "Nitramon" Primer, which must be initiated with "Primacord."

FOR FURTHER INFORMATION on this hard-hitting blasting agent, contact the Du Pont representative in your area or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

### **DU PONT BLASTING AGENTS**

*Products of Du Pont Research*

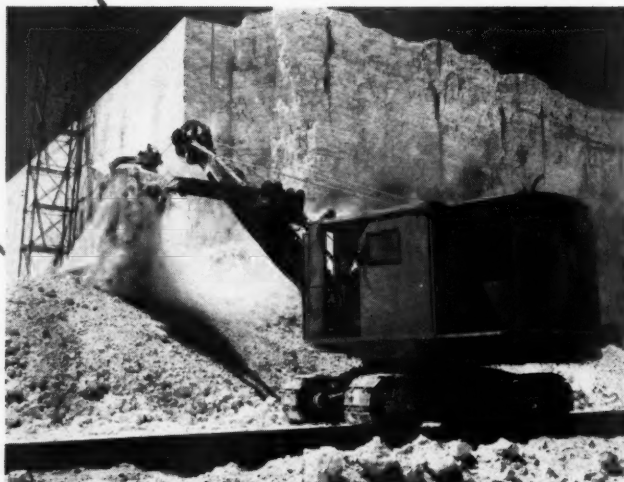


BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

# SULPHUR

helps to create HEADLINE products

PAVING



FLOTATION  
OILS

INKS

CLOTH

RUST-PROOF  
COMPOUND

SOAP

PAINT

CUTTING  
OILS

VARNISHES

**TALL-OIL**

New uses are popping up everyday for this refugee from the skimmings of kraft mill black liquor. Tall Oil is fast becoming the antidote to a lot of supply shortage headaches and cost problems.

That Tall Oil is extracted from black liquor skimmings with the aid of sulphuric acid is perhaps not as interesting as the fact the

process is carried on at subzero (centigrade) temperatures with highly concentrated acid. Most applications of sulphuric are at room temperature or higher.

Here is a relatively new product, certainly a 'headline' product and it requires a derivative of Sulphur in the reactions that make it!



## Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Sulphur Producing Units

- Newgulf, Texas
- Spindletop, Texas
- Moss Bluff, Texas
- Worland, Wyoming



## Power at your Fingertips!

NEW O-B RAIL CLAMP HAS BUILT-IN HANDLE,  
CARRIES 400 AMPS WITHOUT OVERHEATING

For use on any size rail  
up to 100 lbs. Takes No.  
14 to 2/0 cable. High  
strength handle is built-  
in. Weighs only 18½ oz.

**Catalog No. 22461**

**Ohio Brass**  
MANSFIELD  OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.  
Feeder and Trolley Materials • Control Materials • Trolley Shoes  
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4891-M

Bits of Crucible Silicon-Manganese alloy steel shown in holder. They are produced by McLaughlin Manufacturing Co., Inc., Joliet, Illinois.



Operator is shown feeding 7-foot strips of steel into punch press. Crucible furnishes this steel in a special shape designed by McLaughlin engineers. After forming to finished size, the bits are heat treated and the point and cutting edge are sharpened by hand.



*special*  
**CRUCIBLE**  
*alloy*  
*steel*

**gives bits maximum impact and abrasion resistance . . .**

Cutting through abrasive materials like coal, soft limestone and shale demands a *special* steel. A steel that's hard without being brittle — that will take and *hold* a keen edge.

That's why Crucible produces a *special* Silicon-Manganese type alloy steel for the McLaughlin Manufacturing Co., Inc., manufacturers of these bits. It's a steel designed for optimum shock and abrasion resistance.

After McLaughlin tested Crucible's special alloy in the coal fields, their verdict was "This Silicon-Manganese steel is the finest alloy steel available."

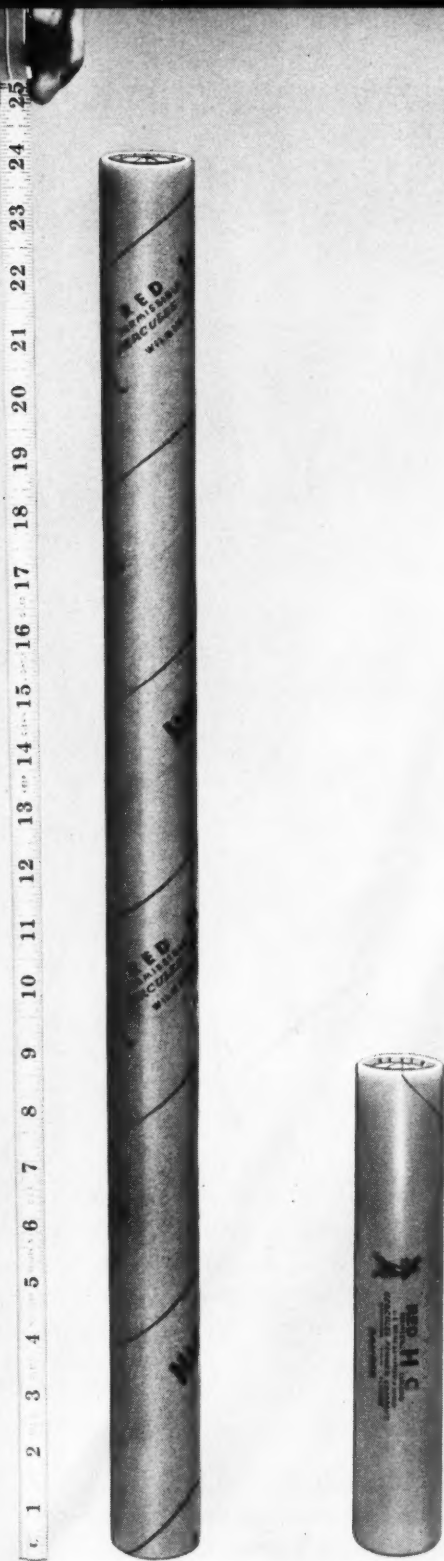
Crucible will be glad to produce a *special* steel to meet your particular needs, too. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE**

first name in special purpose steels

**Crucible Steel Company of America**





THE LONG AND THE SHORT OF IT . . . Here is a new Hercules "King-Size" permissible cartridge—24 inches in length—shown alongside the same grade in the conventional 8-inch size.

# NOW... "KING-SIZE" PERMISSIBLES

Hercules permissible powders packed in "King-Size" cartridges are now available for use in coal mines. Field tests of these new "King-Size" cartridges show that they have many advantages, some of which are:

- A continuous column of permissible powder in bore holes minimizes misfires and reduces the hazard of unshot powder in the coal.
- Predetermined cartridge weights effect economies in the powder consumption.
- Uniformity in loading produces uniform breakage.

Hercules "King-Size" cartridges are supplied in most permissible grades, in lengths from 12 to 24 inches and in diameters of  $1\frac{1}{4}$  to 2 inches.

Our representatives are ready to discuss your explosives needs and to give more information on how the new "King-Size" cartridges can do more work for you at lower cost.



**HERCULES POWDER COMPANY**

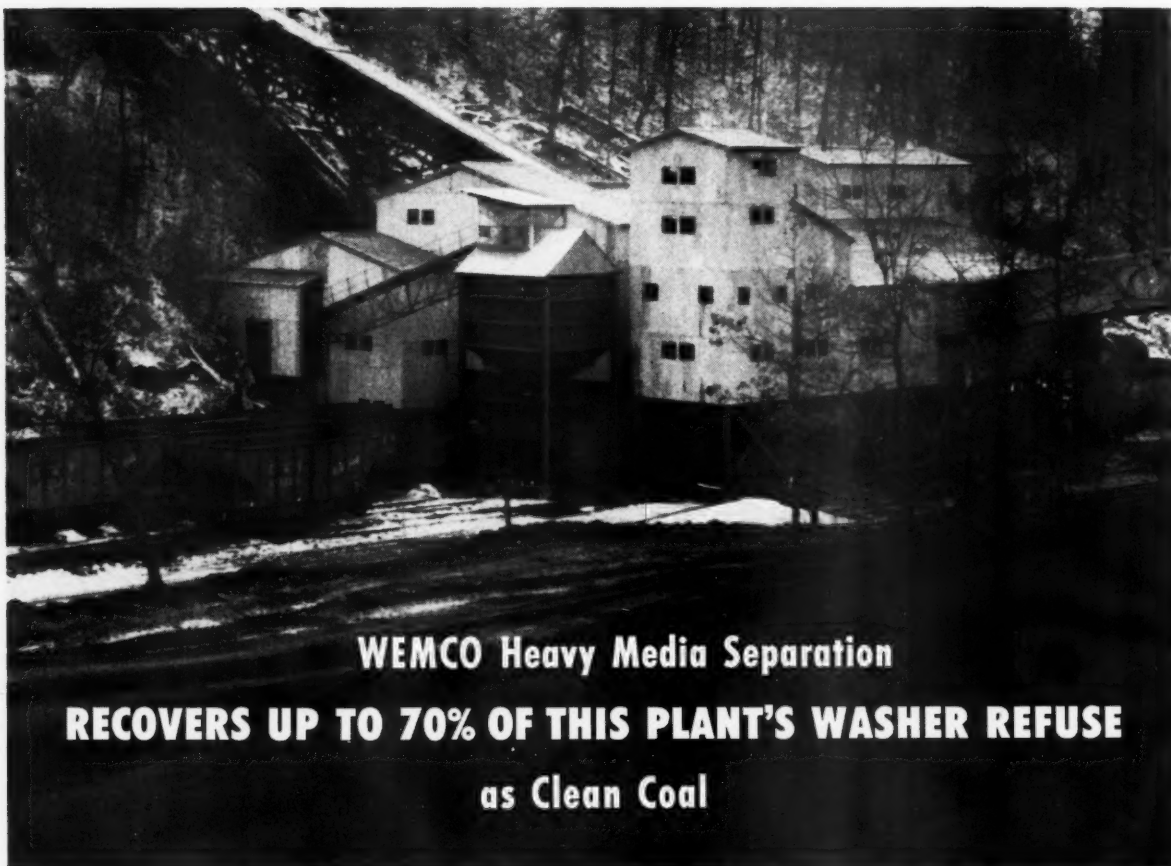
INCORPORATED

Explosives Department, 922 King Street, Wilmington 99, Delaware

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.

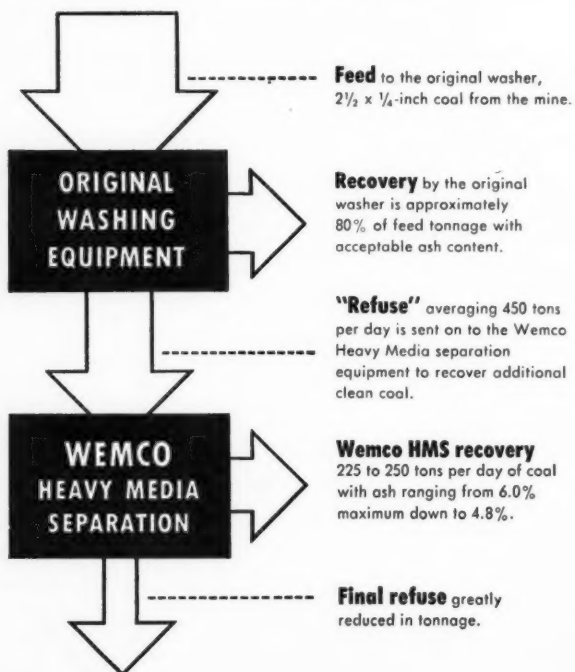
**HERCULES**

XR55-B



## WEMCO Heavy Media Separation RECOVERS UP TO 70% OF THIS PLANT'S WASHER REFUSE as Clean Coal

### The Jewell Ridge story at a glance



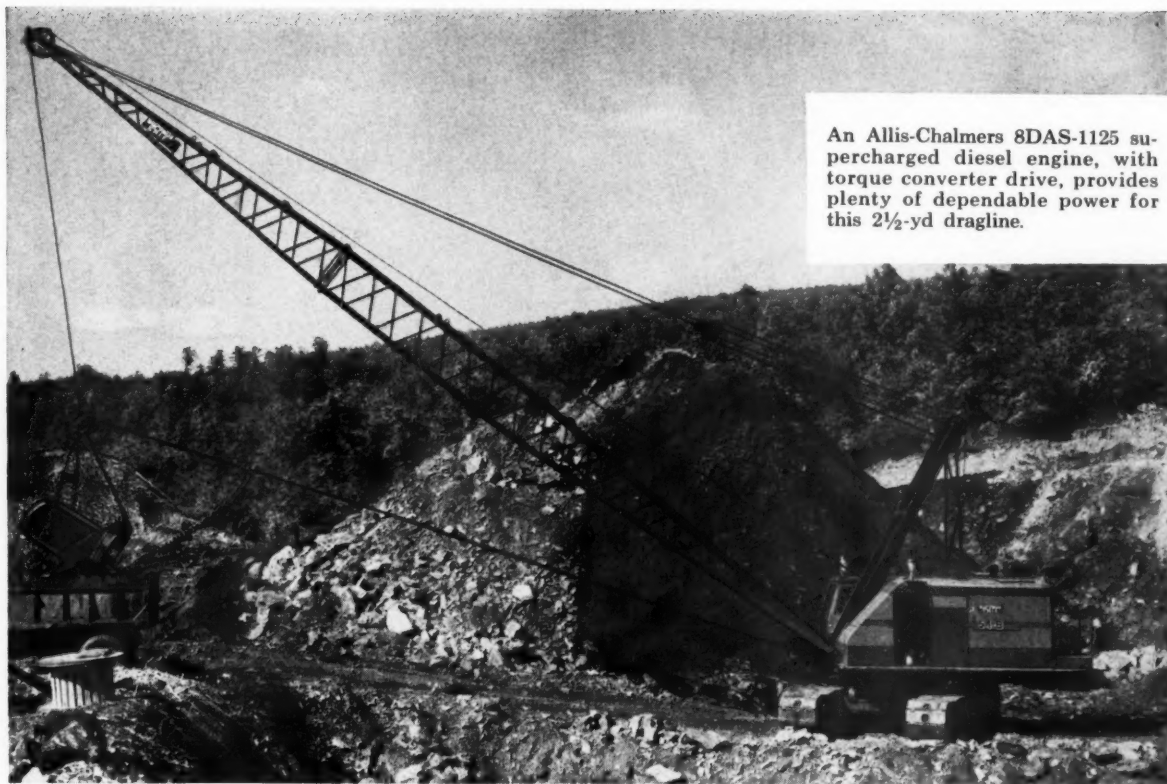
"We are now recovering 225 to 250 tons per day of clean coal that was formerly lost," says the Division Engineer at Jewell Ridge Coal Company in Tilford, Kentucky.

Lab analysis at Jewell Ridge had shown a large loss of coal in the refuse of the original washing plant. A Wemco Heavy Media plant (of Mobil-Mill design) was added to treat the large volume of refuse. It was expected to recover a coal of 11 percent ash, saleable at a low price. But in actual operation, the Wemco Heavy Media equipment has been recovering 225 to 250 tons per day of coal in a range from 4.8% ash to 6.0% maximum. (Jewell Ridge Coal Company has now ordered a second Wemco Heavy Media plant.)

**A Wemco HMS Mobil-Mill  
can earn extra profits on your mine too.  
Write today for full information.**



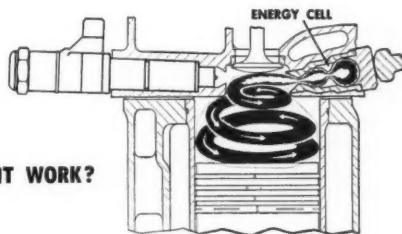
760-Z Folsom Street • San Francisco 7, California  
Representatives throughout the United States and Canada  
and in major countries around the world.



An Allis-Chalmers 8DAS-1125 supercharged diesel engine, with torque converter drive, provides plenty of dependable power for this 2½-yd dragline.

## WHAT "Follow-Through" COMBUSTION IN ALLIS-CHALMERS DIESELS DOES FOR YOU

"Follow-Through" combustion describes the way fuel burns in an Allis-Chalmers diesel engine. Because of it, more energy is released by combustion into productive power . . . engines last longer.

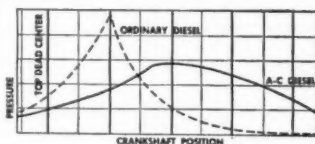


### HOW DOES IT WORK?

Fuel is injected into the combustion chamber and into a special *energy cell*. Combustion starts in the chamber and spreads into the energy cell, where it ignites under tremendous pressure and heat. After a split-second delay, pressure from the energy cell creates a cyclone turbulence in the combustion chamber. This atomizes the fuel and provides a thorough fuel-air mixture. This action produces highly efficient burning, builds up combustion pressure slowly and evenly and retains it longer.

### ADVANTAGES OF "FOLLOW-THROUGH" PRESSURE

This chart compares combustion pressures at different crankshaft positions in Allis-Chalmers and ordinary diesel engines.



In ordinary diesels (dotted line), pressure builds up fast, producing a hammer blow shock load while crankshaft is near dead center.

In the Allis-Chalmers engine, effective pressures are sustained over a longer period when leverage on the crankshaft is more favorable. There is more turning force available for work and it is applied against the crankshaft smoothly.

Result: More sustained power, smoother operation, longer engine life.

"Follow-Through" combustion is just one of many things that are "so good" about Allis-Chalmers diesel engines. You can get the full story from your Allis-Chalmers Buda Division engine dealer.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

# ALLIS-CHALMERS



## Steel arches "give" to make mining safer

The secret of safety in this ore drift lies in the Bethlehem Yieldable Arch sets which "give" instead of deforming under excessive load. The yielding feature is formed by over-lapping two adjoining nestable segments and fastening them together with heavy U-bolt clamps.

The tightness of the clamps controls the sliding action of the arch. Properly adjusted, the joints hold fast under normal loads. But when unusually heavy pressures begin to bear down, the joints yield before deformation of the steel can occur,

permitting natural subsidence of the surrounding strata and redistribution of the load. The structural integrity of the arch is maintained and safety underground preserved.

There's real economy in these arches, too! First of all, thanks to their yieldability, they far outlive conventional timber supports and for this reason alone often pay for themselves within a year. And, on top of that, they are usually recoverable for re-installation elsewhere.

The Yieldable Arch is easy enough to install; no special tools or fancy

equipment is needed. Your own men can set them up and take them down with only a minimum of technical supervision. Pictured above is the standard arch; you can also get Yieldable Rings or special shapes and sizes to meet your individual needs. One of our engineers will gladly give you full details.

**BETHLEHEM STEEL COMPANY**  
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

# BETHLEHEM STEEL







2 Tournatractor-drawn scraper teams easily load from a borrow-pit that was once an old spoil-bank. One team push-loads the other to get good loads in the shifting sands.

# Levees for Swift's open pit mining built with rubber-tired tractor-scrapers

Open pit phosphate mining is used at Swift and Company's Plant-Food Division project at Watson Mine, Bartow, Florida, U.S.A. Levee building is a vital part of this open pit operation. Swift has 2 Tournatractor-drawn scraper teams for this job.

In the open pit mining process, water is used under high pressure to form a slurry of the phosphate matrix in the pits. This solution is pumped to the plant where phosphates are removed — waste "slime" is pumped to settling ponds in mined-out pits at rate of 8,000 gallons per minute. This slime, or refuse, contains 10% solids, which settle in the ponds and permit recovery of the

water. The Tournatractor-drawn scraper teams build levees around these continuously-filling slime ponds. Here's how they work:

## Rigs load loose sand

The rubber-tired machines load waste-dump sand, topsoil, or clay and spread it on the levee around the slime pond. This sand, which the units are loading, is very clean and loose... contains no binder.

Fast, versatile Tournatractor combines pulling and pushing duty in one operation as one Tournatractor-drawn scraper team push-loads the other in this tough-loading material. Rigs then travel over short and bumpy haul-roads to fill.

## Rubber tires "float" over sand

With this loose, shifting, sandy terrain to work in, these rigs and their big, low-pressure tires find their job an easily overcome challenge. The low pressures let the tires "spread" to stay on top of the ground and "float" over the sand. This increased flotation, together with the special tread design, gives the tires a good grip in the sand to keep tractor from sinking into the loose footing.

## 4 wheels do work of 500 track parts

Lubrication time on a Tournatractor is much less than on a crawler because there are 4 wheels doing the work of 500 moving track parts that are exposed to the sand, dust, and grit. In sandy going, such as this, the crawler would require more frequent lubrication with a greater loss of working time. With Tournatractor, the power-train from engine to 4 rubber-tired wheels is completely enclosed. Result: power rides all the way on sealed anti-friction bearings. Lubricants stay clean while sand and other abrasives stay out!

## Can you cut costs with a Tournatractor?

If you have a sand problem... or a place for a "traveling-man" tractor... or two or three crawlers tied down to part-time assignments only a mile or so apart... be sure to check with us for an estimate of possible savings. Whatever your pulling, pushing, or other tractor assignments may be, the high-speed, 208 hp Tournatractor will pitch in anywhere to do a fast, accurate job.

Tournatractor—Trademark Reg. U.S. Pat. Off. OT-919-M-b



After loading, Tournatractor pulls scraper with heaping load from old spoil-bank borrow-pit to waste-dump for building levee.



**LeTourneau-WESTINGHOUSE Company**  
Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



# Magic carpet for

Traffic jams, crowded cars, waiting for cages when changing shifts will be a thing of the past in the Crichton Number 4 Mine of Johnstown Coal & Coke Company. For with the introduction of the new Hewitt-Robins MAN-VEYOR, miners will ride smoothly and safely deep into the earth at the rate of one every 4 seconds. Instead of men piling up at the shaft head waiting for the elevator, incoming and outgoing shifts will be speedily transferred

in a steady stream on this reversible man-carrying belt conveyor.

The new Hewitt-Robins MAN-VEYOR is essentially a standard 26"-wide mine conveyor. Special safety features such as oversized heavy-duty drives, end booms for loading and unloading of men, and a nonskid belt design have been added. The entire system is designed to operate in perfect safety for the transportation of personnel at a speed of 150 feet per minute. Allowing 10 feet per man, this provides a ca-

capacity  
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HEWITT-ROBINS INCORPORATED

CONVEYOR BELTING • INDUSTRIAL HOSE • CONVEYOR MACHINERY • VIBRATING SCREENS • VIBRATING CONVEYORS

[ Page 26 ]

ST  
DESIGN



*Adolph E. Beckman*

# t for miners...

capacity of 900 men per hour. This unique installation of a belt conveyor is one more example of the way in which Hewitt-Robins has maintained leadership in mechanization within the mining industry. For wherever coal is handled in bulk, from face through preparation plant, you will find a specially designed Hewitt-Robins belt conveyor system to handle the job more efficiently and economically.

Although Hewitt-Robins is known primarily as the manufacturer of complete belt conveyor

systems (both belting *and* machinery), we eagerly accept the challenge of solving any unusual problem in bulk materials handling. Hewitt-Robins has unequaled background in all phases of design, engineering and manufacture of such systems to answer your particular materials handling problem. For complete information about Hewitt-Robins products and services, contact our nearest sales office, your local Hewitt-Robins distributor or write to our executive offices in Stamford, Connecticut.

STAMFORD, CONNECTICUT

**Hewitt-Robins**

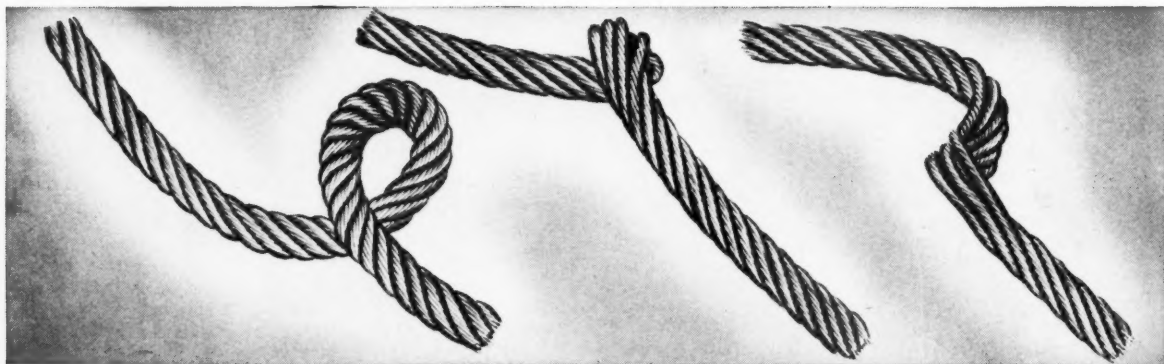


DESIGN, MANUFACTURE, ENGINEERING AND ERECTION OF COMPLETE BULK MATERIALS HANDLING SYSTEMS

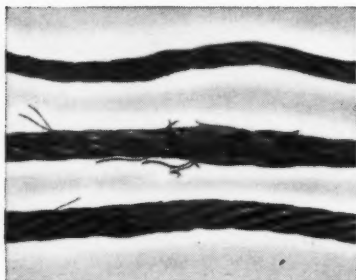
[ Page 27 ]



# Tuffy® Tips



## This Is Often Where The Trouble Starts...



Here are three types of open kinks, all resulting from mishandling of wire rope. Guard against kinks by winding rope properly on the drum, and *never* pull a loop smaller, always enlarge it then straighten out the rope.



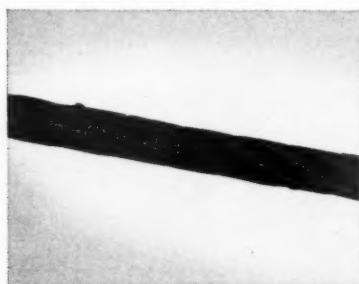
The start and finish of doglegs; the end being the point when all the wires on one side of the rope were worn through. Anything, such as a pulled loop, that causes a permanent bend or "set" will result in a dogleg.



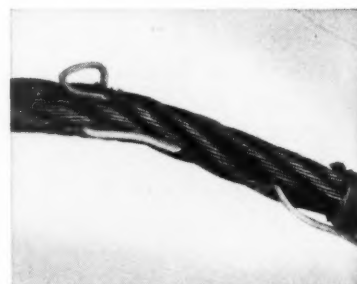
While different wire rope is constructed to resist abrasion to different degrees, improper use leads to injury. Watch for abrasion and when it begins to show locate the point where it is occurring and correct the cause.



Severe corrosive water conditions caused rust and corrosion to produce a one-strand break in this rope. Lubrication during the time the rope was in service would have retarded the damage... added greatly to the rope's life.



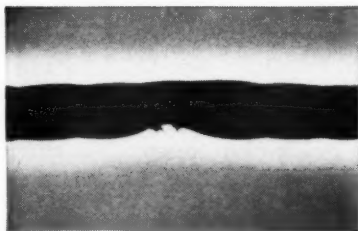
If broken in improperly, high strands like these may result. When installing, make sure that the fabricated relation between *strand with strand* and *strands with core* are not changed.



Nailing a wire rope through the core often causes many undesirable results. The wires and the core are badly damaged. A high strand may develop near the end or many feet away.



# Broken Rules Break More WIRE ROPE Than Capacity Loads

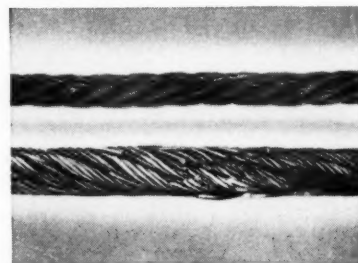


The photo at the left shows what happens when rope is run over or struck by a hard object and crushed. The damage to the strands greatly reduces the service life so carefully built into the rope.

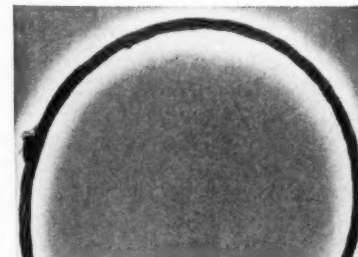
Photo at the right shows how sudden release and rebound from an over-stressed condition may often cause birdcaging. Throwing a loop into the rope is also a major cause of birdcaging. Lang Lay ropes in particular are vulnerable to this abuse.



Here is an example of excessive pinching in the sheave grooves. This rope lasted through only 1-½ hours of service. To prevent pinching, make sure grooves are not worn deep and that the bearing surface is sufficiently large.



Excessive drum crushing like this occurs at points of cross-over or when rope is wound unevenly. Check for even winding of each layer on the drum to prevent crushing of this type.



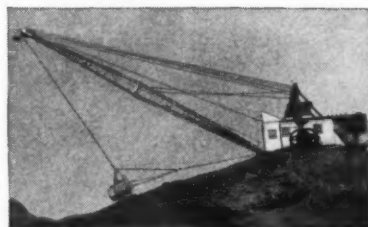
When a popped core occurs, continued use causes the rope lay to lengthen out considerably. This displacement of the core is usually caused by load tension being suddenly removed from the rope.

## Forget Complicated Specifications— Just say Tuffy!



### Tuffy Dozer Ropes

Constructed to increase rope life. 1/2" and 9/16" sizes on reels. Less frequent slip-through for cut off. No waste of sound rope.



### Tuffy Dragline

Two big working advantages: (1) Outer wires have large area to resist abrasion. (2) Inner structure is flexible for accurate casting.



### Tuffy Slings

Constructed to stay extra flexible; kinking or knotting won't materially damage. Unique and strong 9-part machine braided wire fabric construction. With Tuffy Hoist Lines, Tuffy Slings give you a team of balanced performers.



### Tuffy Slusher Rope

A special 3-strand construction which combats rope killing conditions of slusher loading such as drum crushing, extreme abrasive wear and shock loading. Easily spliced.



### Tuffy Scraper Rope

Tailored to cope with the complex destructive forces imposed in the rush of making more round trips or in tough going.



## Your Tuffy Distributor: Dependable Source of Information.

His job is more than just supplying the wire rope you want—when you want it. Your Tuffy distributor is always on the alert to help make your equipment do the best possible job, at the lowest possible cost. When you have a problem that calls for special knowledge concerning your equipment that uses wire rope, give your Tuffy distributor a call. He'll be glad to furnish the help you need including factory engineers.

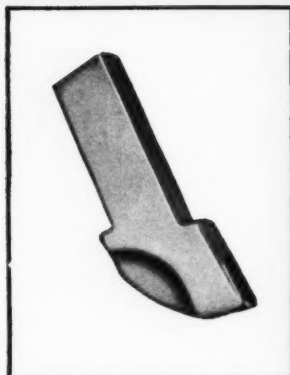
**union Wire Rope corp.**

2144 Manchester Avenue Kansas City, 26, Missouri  
Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand

# CUTTING, DRILLING PROBLEMS SOLVED, PRODUCTION INCREASED 25% with Kennametal\* Cutter Bits and Drill Bits

**THE PROBLEMS:** One operator in Nicholas County, West Virginia had two problems, which together formed a serious production bottleneck: (1) *cutting*—a sulphur streak next to bottom slate

has to be cut in order to maintain proper height for equipment used; (2) drilling—impurities in the coal above this sulphur streak also present “something of a problem.”



**SOLUTION:** Kennametal U7R Cutter Bits were installed for cutting of the sulphur streak, and Kennametal DL-1 7/8" Drill Bits are used for drilling.

**RESULTS:** After one year's operation with Kennametal bits, this coal operator showed an average increase of 5 places cut and drilled per shift, to a new average of 20 places, an increase of 33 1/3%. Tonnage increase was from 475 tons to 650 tons of coal. Hole drilling time has been reduced from between one minute and one-and-a-half minutes to an average of 45 seconds each.

**COMMENTS:** Superintendent of the mine reports that the Kennametal "R" Type Cutter Bit "has proved that it will withstand shock and wear in severest cutting which we have at our mine." He explains that the high production increase is due to:

- (1) no need to spot cutter bits in the cutter chain;
- (2) faster drilling of 6 ft. holes; and
- (3) fewer drill bit changes.

No matter what your cutting or drilling problems are, you will find a Kennametal Bit to do the job fast, with low bit and maintenance cost, and long bit service. Discuss your problems with a Kennametal representative. Or write KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

\*Registered Trademark

8-5933

*Ask about the Kennametal line of augers, pinning rods and accessories*



**INDUSTRY AND  
KENNAMETAL**  
*...Partners in Progress*

# ★ Mining ★

## CONGRESS JOURNAL

*Published for the Entire Mining Industry*  
by the AMERICAN MINING CONGRESS

ROBERT W. VAN EVERA, Editor

Volume 42

MAY, 1956

Number 5

## Let There Be Light

THE Alabama Supreme Court recently upheld a decision against the UAW-CIO awarding a worker \$10,000 to cover loss of five weeks' pay and punitive damages to deter the union from similar conduct in the future. The plaintiff had been physically restrained from crossing a picket line during the first day of a strike. In assuming jurisdiction of the case, the State Supreme Court stated that it "recognizes that the right to pursue a lawful occupation is a property right and the wrongful interference therewith is an actionable wrong."

We commend this Alabama worker for his courage and fortitude in filing his suit and fighting it through the courts. How many workers have had equally strong cases against labor unions that were never aired in court?

## Look to the Future

WE WERE abruptly awakened recently to learn that the Department of Mining and Petroleum Engineering at The Ohio State University is to be discontinued. The mining and petroleum curricula are to be continued in the Metallurgical Engineering and Chemical Engineering departments. Enrollment in Mining Engineering, a five-year course, was only 13 students in the winter quarter of this year—an average of less than three per class. This low enrollment was certainly a big factor in the decision to abolish the department.

Schools have a way of getting nearer one's heart with the passage of time so we can imagine that the Ohio State decision aroused some intense feelings. In the opinion of most of the college authorities, the change was necessary. It must be regarded as an administrative move since no change in the courses offered is involved. Whether or not the decision was right must now be left for the future to tell.

The important questions are, why this decline in mining enrollments and what should be done to check it. Our industry sorely needs more mining engineers and has a responsibility to help attract outstanding students into the field. Faculty members are certainly aware of the problem—it's their bread and butter—but they seem powerless to solve it under present conditions.

It seems unlikely that mere adjusting of pay rates would turn the trick. True, this factor may determine whether a mining engineer stays in his field after getting into the job market, but mining graduates today command as large a tab in beginning employment as the average of other engineers. David R. Mitchell, chairman, Division of Metal Engineering, Pennsylvania State

University, made a study revealing that June 1955 mining engineer graduates at that school averaged \$410 per month as compared to \$385 per month for all other engineers. The incentive of earning opportunity is not lacking. Students today are apparently too objective in choosing their life's work to be greatly influenced by earning potential alone.

Then what does influence them?

Today's student grew up in an environment that extends back, in his memory, only to about 1940. War years, national welfare benefits, unprecedented prosperity, and keen business and professional competition all influence his outlook. He is perhaps more practical and thoughtful than his counterpart of 20 years ago, and he is determined to look out for himself. His choice of a vocation will usually be made not too long after, and in some cases before, his entry into college and will be influenced by the opportunities in fields that seem to him to offer minimum risk with considerable assurance of pleasant working and living conditions. Mining satisfies these requirements admirably, but the industry has failed to put that fact across to these seventeen-year-olds.

There are still other considerations in the minds of these aspiring future leaders. They are too young to possess experience, and as a substitute they must dream and imagine. That is good—and better yet, they seem to keep their dreams in the future instead of the past. What course their thoughts travel is determined in large degree by fragmentary observations and familiarity. Most students have little opportunity to observe the work of the mining engineer first hand, and even those who do, are apt to remember the grime and remoteness of the job rather than the more significant rewards for a mining engineer's accomplishments.

It is the mining industry and not the college curriculum that has to be sold to prospective future engineers. How? Well there doesn't seem to be any "pat" answer, but the increasing number of scholarships sponsored by our mining corporations is certainly a step in the right direction.

Participation in consulting and research projects makes a college instructor much better qualified to present classroom material that will attract our forward-looking student of today. This fact was pointed out by Dean Gordon B. Carson of the College of Engineering at Ohio State during a discussion of the recent dilemma at his school. There is of course no substitute for the conventional pedagogic texts, but supplementing these, some closer contact with current operations and business—in the form of consulting and research projects carried on by his instructors—can be intensely stimulating to the student.

Frequently the best instructors can be attracted to college teaching positions only if there is an opportunity to augment regular pay with earnings from consulting or research jobs. Certainly our schools need top quality personnel on their staffs.

Business leaders have found that more and more long range planning is not only wise, but in many cases is necessary for survival in a competitive enterprise. College teaching staffs are well qualified to carry on many assignments to fit into these planning programs. Should not more mining companies avail themselves of this high-calibre talent for consulting and research work? They will thereby effectively advance their own future planning—and make a valuable contribution to mineral industries education.





The 1600-ft Deep Ruth shaft will produce approximately 25,000,000 tons of copper ore

# Water Handling and Control At the Deep Ruth

**An Engrossing Story of Water Trouble Encountered  
in Shaft Sinking is Presented in the Belief that It Will  
be Helpful to Others Planning Underground Develop-  
ments Under Similar Conditions**

By **JOHN C. KINNEAR, JR.**

General Manager  
Nevada Mines Division  
Kennecott Copper Corp.

KENNECOTT's Nevada organization is first to admit that a great deal was learned while coping with the Deep Ruth underground water problems, but in turn it is felt that such experience has enlarged their capabilities and will measurably benefit future underground operations. This article will faithfully record both failures and successes in the belief that readers may benefit from an evaluation of both.

The orebody under development, known as the Deep Ruth, is a down-

ward extension of the Old Ruth Mine orebody, which was mined through the Star Pointer Shaft at Ruth, Nevada, until its closing in 1948. Existence and extent of the Deep Ruth Orebody was proven in the late '30's by prospect drill operations carried on underground in the Ruth Mine and from surface drilling. Development of this extension orebody was deferred until favorable long-range mining prospects warranted its development. The Deep Ruth Project was approved in the summer of 1951, and shaft sinking began at that time.

## General Development

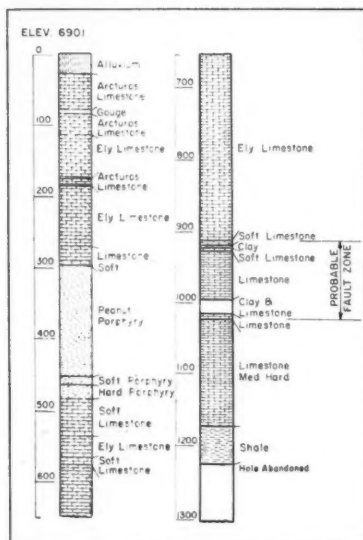
The work to be accomplished prior to production encompassed the sinking of a 32-ft by eight-ft production shaft to a depth of 1572 ft and the enlargement and deepening of an inclined ventilation shaft to a depth of 2245 ft on the incline. Lateral development work on the first of three production levels required a 4400-ft connecting drift between the two shafts and haulage drifts under the ore blocks, together with branch raises. It was necessary to construct surface facilities and in this particular case to move the major portion of the town of Ruth which fell within the expected subsidence area.

Time was of the essence in this development, and realizing the time lag that would occur while Nevada Mines geared itself to this development, it was decided to contract the preparatory work required for first production. After considering various bidders, this work was awarded to Foley Brothers, Inc., contractors, Pleasantville, New York.



## Preliminary Work

In any underground development, shaft location is an important feature. The Deep Ruth Shaft location was determined after considering the maximum cave area which might develop from scheduled block cave mining. Additional leeway was provided so that even with the possible discovery of additional ore at greater depths there was little likelihood of the cave angle reaching the shaft. In turn, availability of the shaft site to rail service was given major consideration. In both considerations the ruggedness of the terrain adjacent to the orebody rigidly limited any selectivity. Character of rock through which the shaft would be sunk was considered, but, in view of the highly fractured ground conditions in all available areas, one location was as good or as bad as another from this viewpoint.



Log of the shaft site diamond drill prospect hole

The selected shaft location, well outside the cave angle and available to rail transportation, was somewhat adjacent to a major fault (Keystone Fault); thus prospect drilling at the proposed shaft site was undertaken to determine ground characteristics. This prospecting was done with a vertical diamond drill hole probing to a depth of 1225 ft. From the surface there was encountered 300 ft of limestone, 200 ft of monzonite porphyry, 700 ft of fractured limestone, and finally the hole bottomed in 25 ft of hard fresh shale.

It may be questioned why this prospect hole was not deepened an additional 350 ft to approximately the total depth of the proposed shaft. The fractured, and at times unconsolidated character of the ground precluded diamond drill or churn drill prospecting much in excess of 1000 ft. This hole was abandoned only after considerable difficulty and determination that future efforts would be of no avail. Further, this hole, bottoming in underlying hard shale, gave reasonable assurance of good ground characteristics over the remaining shaft depth.

## Ground Characteristics

The prospect diamond drill hole crossed the Keystone Fault area at a point approximately midway between the first two production levels, thus the necessity for caution while sinking through this area was anticipated but no other special difficulties were expected. The fault crossed the shaft from east to west, cutting the long axis of the Deep Ruth five-compartment shaft. The strike is approximately north and south, and the dip is approximately 65° west.

Evaluation of information available did not indicate that water in abnormal volume would be encountered in shaft sinking, either in this location or elsewhere. Referring to earlier local shaft sinking history, the Ruth Mine, Star Pointer Shaft de-

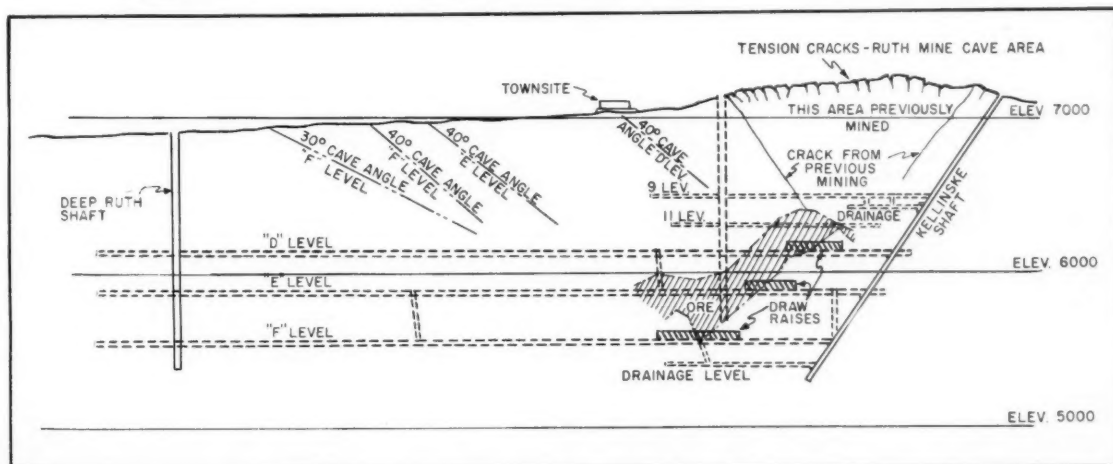
## About the Author



John C. Kinnear, Jr., was trained at M.I.T., receiving a B.S. degree in Metallurgy in 1938, and joined the Kennecott Copper Corp. the same year as a smelter laborer at McGill. He was later transferred to Kennecott's New Mexico smelter operations as smelter engineer and soon became assistant smelter superintendent. Kinnear returned to the Nevada Mines Division at McGill as assistant to the general manager and succeeded to the position of general manager in the fall of 1951. Always active in professional and mining associations, Kinnear recently has become even more widely known through the experiences which qualify him as an authority on underground water handling described in the accompanying article.

veloped a maximum flow of under 1000 gpm, and the wettest shaft in this area, the Alpha, sunk by Consolidated Coppermines Corporation, only developed a maximum 2500 gpm for a few months.

Again it is mentioned that major water problems were not anticipated and probing was only carried out to determine ground characteristics and gain foreknowledge of what difficulties might be had in sinking the Deep Ruth Shaft through the Keystone



Graphic cross section showing relationships of shafts and orebodies

Fault. It was planned to have pumping equipment which would handle up to a maximum of 4000 gpm and this was considered to be adequate insurance with a good margin of safety. Taking advantage of hindsight one might say that cognizance should have been taken of the large volume of water encountered by Eureka Corporation, Limited, in the Fad Shaft development at Eureka, Nevada, some 90 miles from Ruth.

### Initial Shaft Sinking

Sinking of the Deep Ruth Shaft from grass roots was carried on in a conventional manner. The shaft section required an excavation of approximately 34 ft by eight ft to afford inside timber clearance of 30 ft, four in. by five ft, six in. when using 12 by 12 wall plates and ends. Efforts to employ mechanical mucking were unsuccessful due to the unconsolidated and broken character of the ground, which would not allow the minimum sinking lead necessary for mechanical mucking. In fact, considerable sinking was accomplished solely by spading with breast boards securing the sides and hand mucking being done between the dividers. The first 65 ft of shaft were concreted to assure surface stability and to shield ground waters from the shaft. The first 475 ft of shaft sinking was accomplished with no water difficulties, accumulating only a maximum of 75 gpm at this depth. At this depth (475 ft) the shaft was approaching the contact between the monzonite porphyry above and the fractured limestone below. Just past 475 ft the water increased to 500 gpm and just short of 525 ft, this water had increased to 1400 gpm. Sinking efforts at 525 ft broke into a water flow in excess of 10,000 gpm, which flooded this development on May 27, 1952.

Concurrent with the sinking of the production, or Deep Ruth Shaft, enlargement and a further sinking of a 55° incline ventilation shaft, known as the Kellinske Shaft, was being undertaken. Earlier this shaft, at a depth of 775 ft on the incline, was used as an emergency exit and ventilation shaft for the Ruth Mine. Enlargement proceeded with reasonable dispatch, but immediately upon breaking new ground for fresh sinking, a modest amount of water was encountered, and at 875 ft on the incline this small two-compartment shaft (ten ft, four in. by six ft, eight in.) was flooded out with an inflow of approximately 1500 gpm on March 12, 1952.

### Grouting

By the end of May 1952 both development headings were flooded out and the decision to employ grouting or immediate maximum pumping to lower the water table had to be made.

With time still of the essence, grouting was chosen to allow early further sinking to pre-determined levels, where adequate station pumping could be established to handle the water encountered. Establishing sufficient pumping capacity to draw down the water table would have been extremely difficult and, under the circumstances, more than likely impossible. Besides, pumping equipment was neither available nor easily obtained during the Korean War period. Nevada Mines is indebted to Combined Metals Corporation of Pioche, Nevada, and Eureka Corporation, Limited, of Eureka, Nevada, for their timely loan of

as ability to maintain fluidity and prevent early plugging in small channels, maintain the solids in suspension, increase bond and strength, and limit shrinkage when setting up.

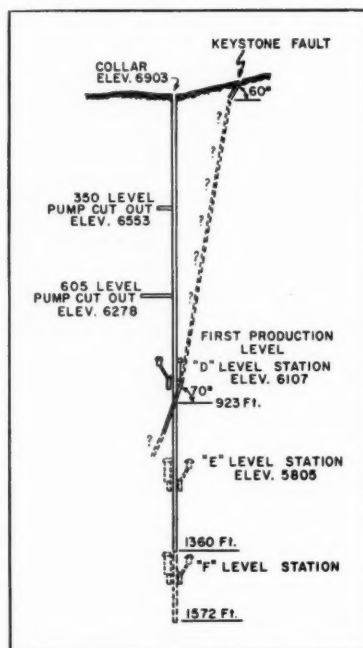
Grouting in both shafts was divided into two stages. The first stage was in preparation and placement of concrete plugs at the shaft bottoms to overcome flooding; and the second stage was grouting for sinking, which included curtain grouting of the water bearing ground through which the shafts had already progressed.

At the Deep Ruth Shaft the estimated 10,000 gpm inflow was shut off by placing two successive concrete plugs under 225 ft of water in the bottom of the shaft. To accomplish this, a bed of sized gravel was spread over the water-filled shaft bottom and was impregnated with a grout mixture to consolidate the mass and thus plug the water channels. The first plug was 14 ft thick but did not seal off sufficient flow to permit access to the bottom with reasonable pumping. The second plug or extension was 30 ft thick. Next, to produce a water-free zone ahead of the shaft, a covering ring pattern of 52 holes was drilled through the plug, and each hole was pumped with grout at the depth at which it encountered water. At the Deep Ruth Shaft this phase was effective only after many successive drillings and groutings.

Grouting at the Deep Ruth Shaft was difficult, time consuming, and expensive, since this water bearing ground was fractured and extremely unconsolidated with quantities of mud or clay filling the rock fractures.

As one would recognize, mud in the rock fracture blocks the travel of the grout which is necessary to consolidate the material. To obtain any consolidation it was first necessary to wash the clay from fractures and cracks in the highly unconsolidated ground. Difficulty of this work is evidenced by the fact that five months were consumed in placing these plugs and grouting in preparation for further sinking. This work required approximately 78,000 cu ft of grout and cost about \$650,000.00.

The Kellinske Shaft was recovered and the bottom dewatered by employing a maximum of sinker pump capacity in the limited area available. Here only 1500 gpm were dealt with, whereas the inflow at the Deep Ruth Shaft was in excess of 10,000 gpm, thus prohibiting dewatering before plugging with a concrete mass. Also, at the Kellinske Shaft water was entering through a definite channel in well consolidated ground, whereas at the Deep Ruth Shaft the water was percolating through the entire unconsolidated bottom and adjacent side-walls. The water coursing through a particular opening at the Kellinske allowed confining to a single pipe. A



The Deep Ruth shaft showing station elevations and approximate location of Keystone fault

pumps and motors which allowed us to accomplish necessary pumping.

Since no prior experience with grouting had been had, this grouting job was let to Intrusion-Prepakt, Inc., of Cleveland, Ohio, as a sub-contract by Foley Brothers. Prepakt is a concern with measurable experience in grouting under a variety of conditions. Nevertheless, the work accomplished in the Deep Ruth and Kellinske Shafts added materially to their experience, understanding, and ability.

Grouting fundamentally involved pumping a mixture of varying proportions of cement, sand and water, which, because of its higher specific gravity, displaces water in caverns. To these basic ingredients Prepakt adds fly ash and a patented admixture, which prevent conglomeration of cement particles and create other desirable grout characteristics, such

concrete plug was placed in the bottom surrounding the pipe. With this plug in place, grout was pumped against the water head in the collecting pipe successfully sealing off the fissure. With the plug in place and the fissure successfully grouted, pattern drilling and grouting through the plug ahead of the shaft bottom was undertaken to form a water free column through which the shaft could be progressed. Some curtain grouting was done with only modest success. As at the Deep Ruth, the period consumed at the Kellinske for dewatering, plugging, and grouting consumed approximately five months. 30,000 cu ft of grout was pumped and a sum of approximately \$175,000.00 was spent.

### Grouting and Sinking

At the Kellinske Shaft, pattern grouting and probing ahead of the bottom allowed the shaft to be advanced to 1346 ft as measured on the incline, or to reach the first production level and sufficiently below for sump capacity. It is definitely concluded that grouting in the permeable limestone formations at the Kellinske assured further shaft development. Without grouting, shaft advancement might have been impossible, or at least extremely difficult. The small cross section of the Kellinske Shaft ruled against the establishment of any volume of sinker pump capacity because this would have left no room for work space.

At the Deep Ruth Shaft, placement of the plug was necessary to gain the bottom. Grouting ahead of the face was warranted to obtain the limited sinking objective of reaching ground suitable in character and elevation to establish a pump station to take care of not only water making on the bottom, but that accumulating from the area just traversed.

The employment of successive pattern drilling and grouting ahead of the Deep Ruth Shaft bottom at 525 ft, or flooding depth, was the method by which the shaft was advanced 125 ft to a depth of 650 ft from the surface, with a minimum accumulation of water. A minimum of 400 gpm was being pumped after plug placements and this rose to 1250 gpm at 650 ft. In obtaining this additional footage, measurable time was spent (nine months), a large volume of grout was pumped (17,000 cu ft), and considerable money expended (\$140,000.00). Nevertheless, these efforts were successful in accomplishing sufficient sinking to reach ground suitable in character and elevation for a pump station. Of great importance was the fact that this pump station was then located where the major volume of water flowed to the station pumps by gravity, thus allowing a minimum of sinker pump capacity on

the bottom to interfere with sinking.

Grouting undertaken at both shafts was done to accomplish the limited objectives of reaching the first production level at the Kellinske end and sinking to suitable location for a major pump station at the Deep Ruth Shaft. It was, and is, a consensus of the Nevada staff that grouting in this highly fractured ground only allowed localized shielding of water from the shaft. It was known that eventually the water would have to be pumped and the water table lowered.

### Dewatering

With the installation of the Deep Ruth 605 Pump Station (605 ft from surface), major volume pumping could be accomplished. In addition to pumping from within the shaft, two churn drill holes were drilled adjacent to the shaft, which penetrated the water

ing dried up in December 1953, and the water being pumped from within the shaft dropped from 4600 gpm in October 1953, to 1950 gpm in November 1954, after 12 months of dewatering operations.

### Pumping and Sinking

With the complete establishment of station pumps at the 605 Station, comprising four - 4GT Ingersoll - Rand pumps and two Byron Jackson pumps (6500 gpm total capacity), further shaft sinking could be contemplated. Sinking was resumed on December 28, 1953, and with the establishment of necessary water rings to keep a maximum of water off the bottom, the shaft was advanced from 650 ft on December 28, 1953, to 1360 ft by December 1954. During this progress, piloting ahead of the shaft with percussion drilling to determine water



Aerial view of the Deep Ruth

bearing zone located between 525 and 600 ft from the surface. These drill holes were equipped with 200 hp Worthington Deep Well Turbine pumps and initially dewatered at a combined rate of approximately 2200 gpm. As the pump station face at the 605 Station was advanced, additional water in this saturated ground developed, and by the end of October 1953, approximately 4600 gpm was being pumped from the shaft, coupled with 2000 gallons from the drill holes, for a maximum of 6600 gpm. Prior to establishing station pumps to handle this 4600 gpm, such volume was handled by two Byron Jackson submersible pumps, capable of handling 3600 gpm, and these were augmented by two Pomona pumps capable of 1600 gpm.

From this high point in water pumping of 6600 gpm in October 1953, dewatering and lowering of the water table was started. The drill hole pump-

make and diamond drilling to determine ground characteristics were standard practice. Success was had in avoiding further grouting. Unless evidence indicated that water in excess of handling capacity on the bottom would be encountered, then sinking would proceed without grouting. This procedure was successful and dewatering of the area continued as we sank.

A chronology of shaft sinking shows that the first production level was established at 800 ft from the collar and as expected the Keystone Fault was traversed between elevations of 900 and 1000 ft from the collar. This fault zone contained highly fractured and unconsolidated ground, with quantities of fault gouge, but the whole was highly impervious to water; thus no additional quantity of water was made while sinking through the fault zone. The normal shaft timbering has reasonably held shaft



alignment in this area; and major squeeze or movement is not occurring. The second production level was established at approximately 1100 ft from the surface, and the shaft bottom is now approximately at the bottom production level, or 1360 ft from the collar.

At this point in shaft sinking, which occurred in December 1954, the pilot holes developed additional water in volume, and this has deferred sinking of the last 220 ft of shaft while evaluation is given to what has been encountered. This long holing and drill probing increased the total volume of water being pumped from the shaft from 1600 gpm in November 1954, to an estimated 3100 gpm, which lowered to 2500 gpm by August 1955. This gives evidence again that dewatering is being, and can be, accomplished.

While continuing to sink the Deep Ruth Shaft, lateral development on the first production level was undertaken from the Kellinske end, and the 4400-ft haulage connection between the two shafts was made on March 25, 1955.

The foregoing advises of the to-date development on this project. Mining has been deferred with preference given late in 1954 to the development of a small orebody above and adjacent to the Deep Ruth Orebody, which must be mined prior to caving at the Deep Ruth. This small orebody, known as the Hi-Minnesota Ore, is now being developed from the old Star Pointer Shaft, and production is to be accomplished over the next two years. During this time, development at the Deep Ruth will be finished and this orebody will be prepared for production as the Hi-Minnesota orebody is mined to extinction.

## Conclusions

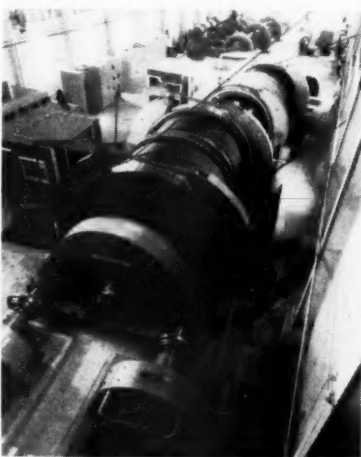
The experiences dealt with in handling and controlling water in volume at the Deep Ruth Project have led to the following conclusions:

In considering an underground project in general, and shaft location in particular, it would be wise to assume that one will encounter water in volume, regardless of the facts at hand which may not support such conclusion. Assuming that water in volume will be encountered, the shaft location should be prospected by a large bore hole, such as can be accomplished with churn drill or rotary rig. The large hole will give some indication of water to be encountered, whereas a smaller diamond drill hole, though affording a core to determine ground characteristics, will not usually give information on water volume. Particularly this is true if the character of the ground is highly fractured and unconsolidated. If the churn drill is used to afford indication of water, it might be wise to duplicate the pros-

pecting with a diamond drill hole to determine ground characteristics.

If the ground is highly fractured, as in the Ruth Area, and thus allows water percolation over the entire area, then shaft location should be primarily determined on the basis of accessibility to ground transportation and the shaft should be located well outside any cave angle projected from possible orebody extension.

Supporting the position that the particular shaft location of the Deep Ruth did not produce more or less water than might be occasioned in other adjacent locations, one is reminded of the fact that water in volume was encountered at the porphyry-limestone contact out from the hanging wall of the Keystone Fault, and



These hoists, to raise cages and 12-ton skiploads at the Deep Ruth shaft, are powered by two 1650 hp motors

then later, water back in the footwall was encountered, concluding that a location on either side of this major fault would have produced water in volume.

On general preparation for shaft sinking, it is warranted insurance and a prerequisite to afford latitude in approaching water problems, that a grout plant be part of the necessary shaft sinking equipment. On proceeding with shaft sinking, long hole probing, 50 to 100 ft ahead of the bottom, should be done to alert of water when there is still an adequate barrier between the bottom and any water course or water saturated ground.

If water is encountered, the decision to grout for permanent seal or to obtain a limited objective, or to resort to immediate pumping, should be judged on the basis of the situation at hand and the facts gathered at that time. As a general rule and guide, grouting can be accomplished with reasonable chance of success and at a reasonable expenditure where the ground formations are permeable, do not contain excessive quantities of mud or clay, and possess a reasonable

amount of structural competence. If the ground is highly fractured and incompetent one can definitely conclude that grouting will be expensive and of some questionable permanent value. Further, if the ground over the general area is highly fractured, and particularly if a caving operation is to be employed, then the chances are that the water will require pumping in the final analysis; thus one must balance the economics of a temporary grout shield to allow early progress as against a time lapse for pumping.

The following is of minor significance and of small consolation in offsetting the difficulty and cost of handling underground water on the Deep Ruth Project, but it can be mentioned that some 1000 gpm of potable water have been isolated at the Kellinske Shaft, thus assuring adequate water for the Ruth mining community and, as contrasted to earlier necessity of purchasing water from the adjacent county seat of Ely, water can now be sold to this city.

One might facetiously say, "Don't find ore where water is to be a problem." But a more practical comment is, "Have plenty of time and money available if planning an underground venture where water is suspected."

There is no pat answer to handling water problems in underground operations that will apply to all varieties of locations, and a good axiom would be, "If water is encountered, stay cool and in a sense put some on your forehead; then hold up, stop, and take ample time to evaluate that which must be overcome."

Here is an appropriate quote from some unknown source, "One can't judge a book by its cover." This is exceedingly apropos of the state of Nevada. Its rugged mountains seem to forbid exploration and development of mineral resources, yet beneath the surface vast treasures have been discovered over the past full century and no doubt will continue to be found in the future. Nevada valleys are, in the main, dry and barren alkali waste flats, but on exploration one finds water in volume and now possibility of oil. You definitely can't determine with any finality what is below the surface in Nevada by anything but actual exploration.







To remain competitive today, a coal company must use every means at hand to produce a better product at a lower price

# Industrial Engineering— Management's Tool

**Industrial Engineering, Used to Complement Management Thinking, Has Enabled this Coal Company to Reduce Labor Costs 22 Percent and Supply Costs 26 Percent Without Purchase of New Equipment. Big Thing Is to Use It as a Tool and Not as a Substitute for Progressive Thinking**



By **HERBERT E. JONES, JR.**

Executive Vice-President  
Amherst Coal Co.

A TOOL, in any sense of the word, is an aid the value of which depends upon the skill with which it is applied. It does no good to have a suitable tool if it is not going to be used correctly. Conversely, any tool which is not properly used can sometimes be more harmful than beneficial. Thus, management must first decide what it plans to accomplish with the aid of industrial engineering. The problem must be analyzed to determine if a method or a procedure can be devised and applied in a practical manner to improve or benefit the particular situation.

It might be interesting to ask why a coal mining company would require industrial engineering and what it would expect of it. I might illustrate this point by giving some past history of the Amherst Coal Co.

## Face Variable Operating Conditions

Amherst is now engaged in the production of approximately 15,500 tons of coal per day from nine mines. These mines range in size from 3000 tons to less than 1000 tons and are in seven different coal seams in Kanawha

and Logan Counties, West Virginia. The great difference in seam conditions, mining heights, percentage of impurities, and all the other variables which accompany coal seams, make it extremely difficult to develop systems of mining which will fit all these conditions.

For many years it has been the policy to standardize on equipment, with the result that today practically all underground mining equipment is completely standardized as to the manufacturer and type in each category of mining equipment. Quite obviously, the proper type of equipment

cannot be chosen for a particular job until all factors are known.

For several years mining methods had been under intensive study. While the company has been competitive with other companies operating under similar conditions, it had long felt that many of the methods could be improved. With a background such as this, Amherst Coal Co. decided to embark on a program of industrial engineering. It was finally decided to call in some outside firm to assist in setting up an industrial engineering program.

### See Use for Incentives

After several discussions with the firm finally selected, it was decided to do two things, (1) establish a supervisory incentive program, and (2) develop production standards. It was

felt that the incentive program should both increase the "take home" pay of supervisors and, at the same time, decrease costs. The standards program would set up the proper goals and controls for the incentive program.

The supervisory incentive program is based upon labor and supplies and other material under the control of the mine supervisors. Labor costs and supply costs would be established over a certain base period and any improvement made in the future over this period would be translated into a dollar bonus for the supervisors. This bonus plan was designed to present to the foremen the opportunity to increase their earnings by developing and using improved methods and mining techniques on the job, thus reducing the cost per ton and increasing realization where feasible. These

budgets are variable and take into account mining conditions, which may change from month to month.

### Program Has Helped

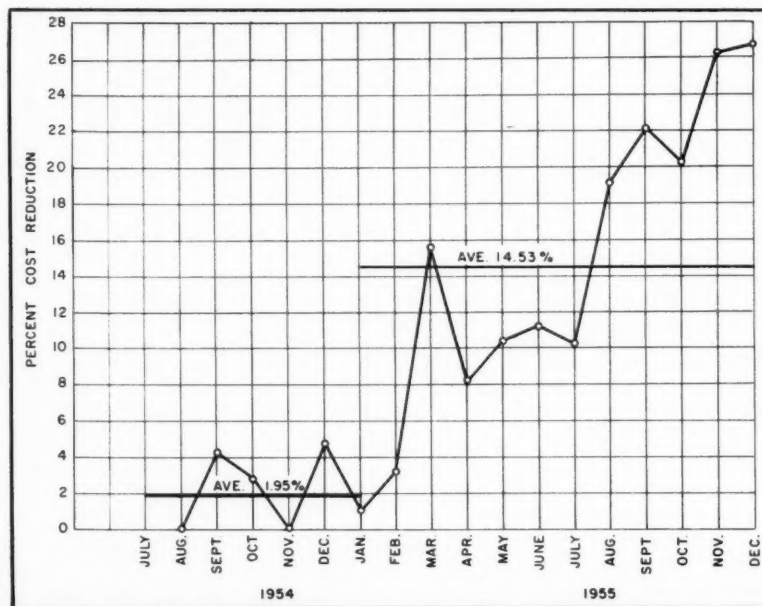
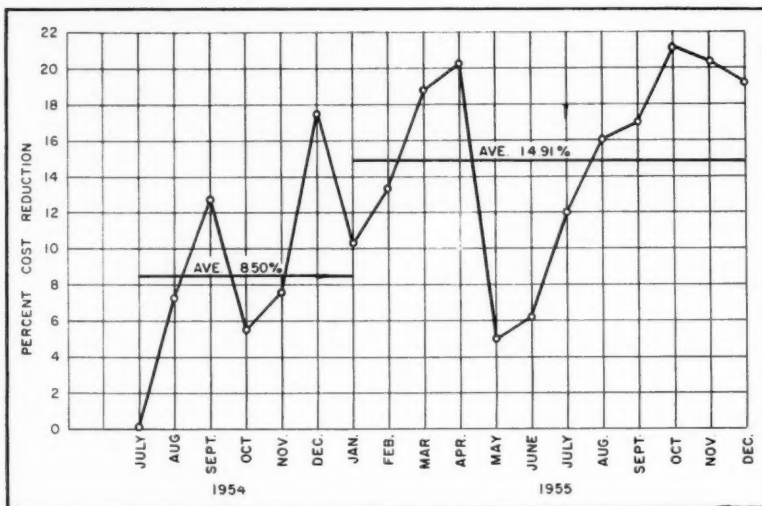
This program was put into effect at one mine in September 1952. Since then all operations have been brought into this program and the results both to the supervisors and to the company have been most satisfactory. In these many months standards for all types of mining under a variety of conditions have been developed. These standards were built up from numerous studies of actual operations. No standard was adopted until all parties concerned were in agreement that the standard was fair. Sufficient allowance was made in developing the standard for unforeseen work stoppages and other unpredictable factors so that the standards would be in themselves flexible. This flexible standard would, then, require less actual remeasurement than a more rigid set of standards.

At the time Amherst started its industrial engineering program a number of conveyor mines were being operated. Coal was loaded by hand on chain conveyors and production was far from satisfactory. A determined effort was made to improve conveyor performance and after the development of conveyor standards it was found that performance was improving quite rapidly. However, at the same time that costs were being reduced, the market price for coal was also being reduced. In the end it was decided that the declining coal price was going to win the race and we have since closed our hand loading conveyor mines.

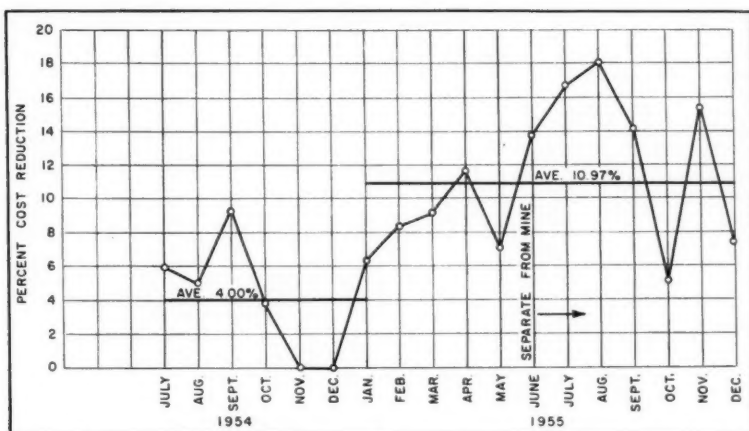
At the present time Amherst is operating one mine using a combination of small loading machines discharging onto chain conveyors for entry driving and a German coal planer for mining the developed blocks of coal. This combination has proven successful for mining the thin bench Eagle seam. Operating in a seam of coal 40 in. thick with bad top, the coal company finds the over-all cost of this mine is quite comparable with mines having seam height of 4½ ft or better. This system was developed after a very complete industrial engineering study of the methods involved. The result of this study was a 24 percent saving in labor and a 36 percent saving in supplies over the method of all mobile loading onto chain conveyors.

### How Does It Work?

How does Amherst Coal Company's Industrial Engineering Department function as an aid to management? There are now three industrial engineers. One is a methods engineer, one is a cost control engineer and the third



Cost reduction performance at two mines over an 18-month period



Cost reduction performance at a mine tippie during an 18-month period

is a production engineer. In addition to these, there is normally a fourth engineer in training who is a mine foreman or mine engineer. He spends three months with the Industrial Department. At the end of his three months he goes back to a production supervisory job. In this manner nearly all mine foremen and mine engineers have been trained in the Industrial Engineering Department.

Industrial engineering can be a most important aid to management. However, there are certain pitfalls which must be avoided. The mere conception of a cost cutting or production increasing idea is not enough. This idea must be thoroughly evaluated and then sold to the production personnel. This selling job cannot be halfway, it must be complete or else the idea will fall flat. Amherst has been unusually fortunate in gaining the wholehearted cooperation of the production personnel. In most cases they are more than eager to try something new and have many times advanced ideas of their own which have been utilized.

The coal company has been in this program for almost four years and has made significant steps toward real improvement in its methods. However, we feel that we only have begun to scratch the surface. The more the problem is examined, the more facets that are found which need polishing. It is really a never-ending task. The improvements made in one phase of the operation suggest similar improvements in sequence operations. These in turn influence various objectives which can be accomplished in other phases.

### Industry Has Come Far

In the coal industry, management has had to face a variety of changing conditions. Going back over the years for a moment, we can see that the industry has faced four distinct ages or phases of development. The first phase may be considered the early

days—from 1900 to 1929 when mechanization was just in its infancy and most coal was loaded by hand. The market was firm and oil and gas development was just coming along. This phase progressed into the early days of the 1930's, when the first real efforts were made to study production problems from a scientific and engineering methods approach. In the first years of conveyor mining, for example, some very significant accomplishments were made in this direction.

With the advent of World War II a general relaxing of standards came about. This was caused by a scarcity of skilled labor and competent management. However, in this period, and up until almost 1949, while the demand for coal was very good and the prices were high, a great many significant strides were made in full mechanization of coal mines. This mechanization was done in most instances with the thought of increasing machine production rather than strictly for the viewpoint of cost reduction. In the late 1940's the coal industry again turned to a more exact method of cost improvement and once again, engineering methods and industrial engineering studies were given a tremendous amount of thought. The decline of realization and shrinking coal markets forced the industry to find ways to compete with other fuels.

### Stakes are High Now

Probably at no other time in the history of the coal industry have the stakes been so high as they are today. We are on the threshold of a most decisive era. A drop in coal consumption would mean nothing but mines closing and coal miners being out of work, while an increase in coal demand can be a real opportunity. Serious competition has come, not only from oil and gas and now atomic energy, but also from within the industry itself. Coal companies are spending millions of dollars for machinery and

cleaning plant facilities which will result in making them more competitive with one another. Except for very unusual periods, no company can survive unless it can produce coal in the most efficient manner. This calls for intense concentration on methods and procedure. Each and every job, every expenditure, every phase of mining operation must be carefully observed and studied to see where economies and improvements can be made.

Industrial engineering will surely be called upon to produce miracles of production efficiencies. Those who are faced with the problems of operating coal mines in the past few years have witnessed a downward spiral of coal prices while at the same time trying feverishly to reduce operating costs to keep pace with the coal prices. The downward rush of coal prices came to a halt last year and turned upward. However, costs generally have begun to rise again. And coal prices seem to be leveling off. There again you have the old squeeze between production cost and selling price with the margin getting slimmer each month.

If coal companies are realistic in their approach to these problems in the next few years, stabilization can take place in the industry. There will probably be 500,000,000 tons of coal consumed this year. While that is a far cry from the post-war years of more than 600,000,000 tons, it still represents a tremendous volume of material. The coal industry will still be the greatest volume handling industry in the nation. If we use the best techniques at our disposal, we can provide the nation, and also foreign countries, with energy at a lower price than competitive sources. By so doing we can establish coal once again in the position of the dominant supplier of energy in this country. But this is not easy to do and it requires a tight fist and hard-hearted approach. It cannot be done by compromising principles and by avoiding the hard economic facts of the situation. These facts must be acknowledged and the cloth must be cut accordingly.

### How to Remain Competitive

What must a coal company do to remain competitive?

Operations must be studied and methods must be analyzed. Each individual operation must be considered in the light of its value to the company under the present economic situation. Methods must be analyzed to bring the greatest return on invested capital with equipment already on hand.

In many cases the maximum output of present equipment is not being reached by any standard. Only after a thorough study has shown that present equipment will not do the job, is it necessary to consider different equipment. And then the selection of this equipment must be thoroughly analyzed. Altogether too much equip-



ment has been sold to the coal industry which will not sufficiently out-perform the so-called older equipment which it is alleged to surpass. In many cases minor change of methods or rearranging of crews will give the old equipment added output capacity which makes the purchase of newer equipment unnecessary. Besides, how can you condone capital outlay when the investment return is either non-existent or ridiculously small? What the coal industry needs is new ideas and methods rather than new machines. Nearly any loading machine will load two tons per minute and there are 480 minutes in a shift, but who averages 960 tons per loader? The potential is there—it is up to us to get it.

### Industrial Engineering's Part

The industrial engineer assigned to the problem can devote his thinking to this with an open-minded approach. A manager has difficulty solving these problems because he cannot devote his full mental powers to thinking about them. The over-all problems of running a business consume most of his time and thinking. A manager can organize his operations so that much of the routine will be handled by pre-arranged orders and then he will have more time to devote to such problems, but much must be left to the industrial engineer. The industrial engineer serves management by studying new methods and procedures, eliminating the chaff, and presenting a practical answer.

What should be the role of the industrial engineer in a going business? Management must decide how indus-

trial engineering should fit into its organization. If it is going to be a staff function, how will its recommendations be passed on to the operating personnel? If it is going to be a line function, how much authority shall it have? There is certainly a middle road to take in answering these two questions. However, this is where management must be most careful. A lot of mistakes have been made in companies by giving too little or too much authority to the Industrial Engineering Department. Some companies are run entirely on recommendations of the Industrial Engineering Department. Others have elaborate departments which make many good recommendations, and still these recommendations are not given sufficient impetus by management to see that they are carried out.

The ideal way would be to balance industrial engineering with the rest of the organization in the same manner in which the other departments are integrated within the company. It would be neither a line nor staff function, but an integral part of management. It would have both advisory and management duties. The effectiveness of the Industrial Engineering Department must be carefully judged so that it does not perform duties which it is not qualified to do and on the other hand its efforts should not be wasted. It is much better for the industrial engineers to carry out their own recommendations than to have someone else carry them out. This eliminates impractical recommendations and at the same time gives the operating personnel a first hand look at industrial engineering.

The industrial engineer has a definite part in the company organization. In this age of specialization, many companies have realized that certain phases must be handled by persons trained specifically in this particular line. Management must never cease, however, to continue its efforts to train well rounded personnel. Many companies today are going through frantic searches for top executives. This has resulted from lack of a well-rounded training program for management personnel. Even though we are in the age of specialization, the man who has had a broad training will be better able to assume the duties of management when the time comes. Therefore, it would be unwise to substitute an Industrial Engineering Department to do the progressive thinking of management. It should be a department which complements management's thinking rather than doing it for management.

### Past and Future

What are the results? For Amherst Coal Co., labor cost has been reduced 22 percent and the supply cost 26 percent. This was largely due to higher efficiency with small production crews, concentrated mining procedure, and the education of mine personnel with regard to economy of supply usage and reduction of excessive waste. It is significant to note that this was accomplished without the purchase of new equipment, but with better use of existing equipment. During 1953, 1954, and 1955 the supervisors earned approximately 10 percent of their salaries as bonus. This supervisory incentive bonus plan has encouraged close cooperation between different departments with resulting better relations.

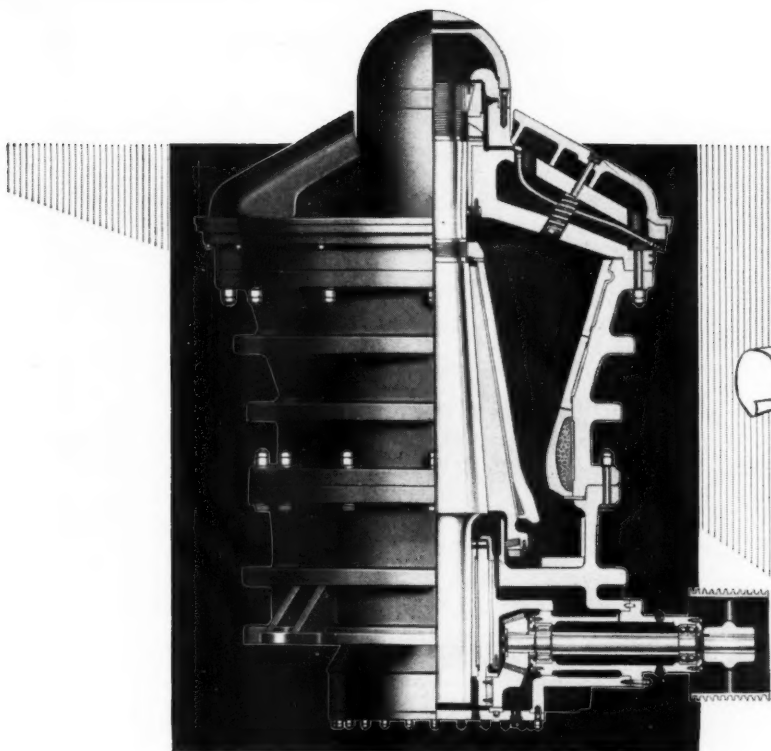
What about the future? Progress from now on will be slower because the big changes have been made. In the future we may go to an incentive plan for everyone, but that has not been worked out yet. Our methods can still be improved and our standards will be raised as new performances point the way to better methods.

The coal industry can point with pride to its achievements but it cannot relax. Its real future lies in its ability to put a less costly product on the market which will mean a broader and more extensive market for coal. The fate of the coal industry hangs on its ability to do a more efficient job because past history has shown that when a product is cheap enough, its use becomes more widespread. Unfortunately, the job of putting coal in the railroad car is only a part of the over-all picture of the coal industry. Unless the coal industry is assisted by the unions and the railroads and the governments, both state and local, and unless it gets realistic help from these groups, it will not succeed in accomplishing the job it sets out to do.



Standards, an important part of any industrial engineering program, must be fair and should be accepted by all parties concerned





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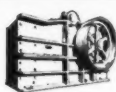
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Central radio controls are located in the "Lookout" building on the edge of the pit—Shown in circle on the cover picture

# Radio Communications in the New Cornelia Pit

By JOHN A. LENTZ, JR.

Mine Superintendent  
Phelps Dodge Corp.

MINING operations in the New Cornelia open pit at Ajo, Arizona, are presently moving approximately 75,000 tons of rock per day. There are 13 active mining levels, the uppermost of which has a circumference of nearly three miles. Ore and waste is hauled by rail from the pit to crushers located one-half mile from the rim or to waste dumps located approximately one mile from the rim. The pit is served by approximately 37 miles of tracks and 30 miles of roads. The scope and complexity of the operations have increased considerably since 1950, when the first two-way radio equipment was purchased, and radio has been an important factor in maintaining efficiencies. The first radios met with immediate acceptance, and there has been a demand in each subsequent year from both foremen and other employees for the installation of additional units.

## Present Radio System

In the Ajo operations there is no need to communicate by radio with areas very far from the pit itself, and

the topography in the immediate vicinity of the pit is favorable to short wave radio transmission. Accordingly, the power of the transmitters used at each of our two central stations is only 30 watts, and this has proved adequate. Moreover, direct communication between the 10-watt mobile sets is seldom impaired by natural obstructions.

The present radio system supplements a pit telephone system and other communication mediums such as whistle signals and light signals, but these other facilities have now become of secondary importance. Two central radio stations and two transmitting frequencies are used. One station is located in the mine office building and the other is in the chief dispatcher's room or "lookout" building which is located on the edge of the pit. The "lookout" building houses, in addition to radio receiving and transmitting facilities on both wave lengths, the central switchboard for the pit telephone system and the control board for the power switches and signals used on the main rail haulage system.

One frequency (154.57 Mc) is used

In the past six years, radio communication has become an accepted practice at many mining operations. Some companies have had trouble with interference from other users of industrial radio—and the problem of allocations for the mining industry is currently under study by the American Mining Congress with a view to correcting the situation.

Over all, operators have almost invariably found industrial radio to be a time and money saving production tool. Contrary to usual experience with mining innovations, radio has, from the beginning, been enthusiastically received by almost all workers who have been concerned with it. Such has been the experience at New Cornelia—described here in detail.

exclusively for rail haulage operations. Transmitter-receiver units operating on this frequency are installed on eight locomotives. The other frequency (154.49 Mc) is used principally for units mounted in foremen's pickup trucks and certain supply and service trucks. At present there are 32 truck mounted units, one unit mounted on the mine switch engine, and four portable hand units that operate on the same frequency. The portable units are used principally in blasting work.

Special equipment is available at the mine for repairing, testing and aligning of transmitters and receivers for best operating results and to conform to requirements of the Federal Communications Commission. Two spare

units are maintained for quick replacement of truck radios in case of failure.

### Time-Saving Benefits

The greatest inherent advantage of radio as a communication medium in any large open pit compared to direct contacts and pit telephones is that it is faster. Direct contacts require a great deal of travel time. Pit telephones involved fixed installations and connecting wires which are difficult to maintain in areas that are being worked and, because of this, the practical number of installations is limited. Radio saves time. It saves the time of supervisors and employees that would otherwise be used for travel,

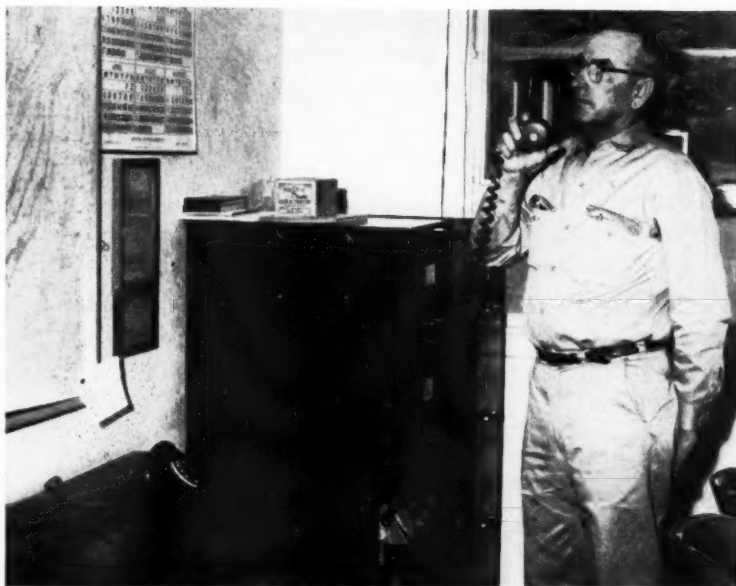
### About the Author



The author is thoroughly versed in the past, present and future of the New Cornelia mine where he has been employed since 1936. Lentz advanced through the mining engineering department to positions of assistant mine superintendent, mine superintendent and now general superintendent. He is responsible in large part for the great technological strides made at New Cornelia in the past 20 years.



Locomotive engineer talking on diesel locomotive radio



Foreman using radio in mine office building

and it reduces delays to operating equipment.

In the New Cornelia pit, the reduction in delay time can be readily seen when an important piece of equipment such as a shovel breaks down. In most such cases, the information concerning the nature of the failure can now be discussed over the air with the appropriate foreman within a very few minutes, through one of the many mobile radios which are regularly moving throughout the operation. The foreman can then order the necessary repairmen and repair parts by radio or he can instruct the operating crew to move to other equipment. Otherwise, unless the foreman happened to be in the immediate vicinity at the time of failure, valuable time would be consumed while he traveled to the location and in many cases made a personal trip out of the pit to secure repairmen and parts.

### Coordinates Supervision

Radio makes possible better coordination of supervisory effort. The operating program that has been discussed with the foremen at the beginning of a shift may have to be changed or augmented in several respects before the shift is over; shovels break down, derailments occur, blasting schedules have to be changed, and many other things happen that may affect several different pit operations. Radio makes it possible for all foremen to keep in almost constant touch with these developments and to make such revisions in their particular operations as are necessary.

Although the main electrified haulage system is equipped with power

(Continued on page 66)



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# The Buckheart Preparation Plant

**This Midwestern Coal Preparation Plant Fulfills Requirements of Five-Point Modernization Program**

THE BUCKHEART mine and preparation plant of The United Electric Coal Companies are located four miles south of Canton, Ill., in Fulton County. Production of coal is from the No. 5 seam, which averages 58-in. thickness, and is overlain with a mantle of sandy soil and gravel on a base of shale, black slate and some rock. The cover is stripped in two stages; the first cut is made with a wheel excavator which removes the topmost strata of sandy soil and gravel leaving a bench of shale and slate which is dug, after blasting, by a power shovel. The exposed coal is drilled, shot, and loaded with a power shovel into 40-ton trucks and hauled to the preparation plant.

## Planned for Future

Entrance into a field of coal varying in inherent quality and an increase in demand for coal by public utility power plants indicated the need for utilization of more efficient and flexible washing equipment and increased coal preparation capacity. As a result of these factors, in 1951 United Electric initiated a study with the aim of modernizing the coal preparation methods at this operation. The program of modernization undertaken included the following as the primary objectives.

- (1) Increase raw coal feed capacity from 600 to 1000 tons per hour.
- (2) Eliminate former hand pick-



By **ANDREW J. GABER**

Preparation Engineer  
United Electric Coal Companies

ing methods for preparation of larger sizes of coal.

- (3) Utilize a system of preparation to assure a uniform washed coal product and maximum recovery of salable coal.
- (4) Increase recovery of coal in the minus 5/16-in. sizes.
- (5) Design the plant to permit the new structure to be connected to the existing structure with a minimum of shut down time.

The Nelson L. Davis Co. was awarded the contract in 1952 to design and engineer the new plant and to furnish four "Neldeo" processors, together with the conveying, crushing, screening, hydraulic, and electrical equipment. The company elected to erect the structure and install the equipment under the supervision of its engineering personnel and with the labor force normally required to operate the mine and preparation plant.

## Coarse Coal Cleaned by Dense-Medium

Figure 1 is a simplified diagram of the flow of coal from the dump hopper to and through the dense-medium plant. A remotely controlled variable speed double-pan reciprocating feeder under the 150-ton capacity truck dumping hopper feeds the run-of-mine coal at an average rate of 1050 tph to a 72-in. wide conveyor inclined at 35°. The rate of plant feed can be regulated over a considerable range, if required, from the plant control center located on the heavy medium processor floor.

Run-of-mine coal is discharged into a 12 by 19-ft steel-built roller mounted Pennsylvania Bradford Breaker. The breaker was installed to replace a crusher, which, due to the presence of large sulphur balls in the run-of-mine feed, was subject to frequent plugging and high maintenance cost. Manga-

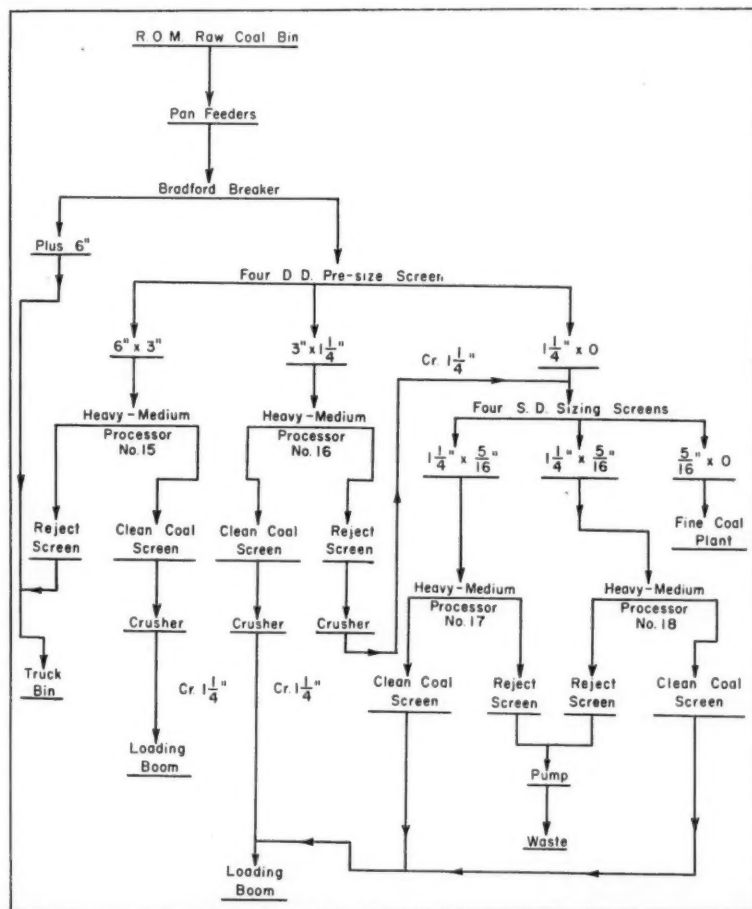


Fig. 1—Simplified coarse coal flow sheet



An average of 1050 tph of raw coal is fed to the Buckheart preparation plant

nest steel plates with 6-in. diameter holes are used throughout the breaker. In this installation only four rows of adjustable deflecting shelves are provided and are set 90° apart dividing the inner circumference of the breaker into four equal sections. A sturdy, fixed plough at the discharge end aids in removal of the plus 6-in. material. Oversize rock, sulphur balls, some hard bony coal, and other tramp materials rejected by it are discharged directly into a bin from which it is hauled by truck to the gob pile. The resultant 6-in. by 0 raw coal discharges directly onto an inclined 48-in. belt conveyor. Under the feed end of the breaker a sloping chute deposits an initial layer of fine coal on the belt to cushion the impact of coarser and heavier material screened out later in the cycle of treatment.

A 60-in. flight conveyor receives the discharge from the 48-in. belt conveyor, and distributes the tonnage equally among four 5 by 14-ft double-deck vibrating screens which produce 6 by 3-in., 3 by 1½-in., and 1½-in. by 0 sizes. Recirculated water is used on these screens to pre-wet the 6 by 3-in. and 3 by 1½-in. sizes prior to dense-medium washing, and to sluice the 1½ by 0 to three 6 by 16-ft single deck vibrating screens producing 1½ by 5/16-in. and 5/16-in. by 0 sizes. This water also sluices the 5/16-in. by 0 raw coal to a sump from which it is pumped to the fine coal plant. An additional benefit of the pre-wetting water on the 5 by 14-ft screens is that of maintaining screening efficiency during periods when wet coal is received from the mine.

Both the 6 by 3-in. and 3 by 1½-in. sizes of raw coal are conveyed in a 60-in. double-compartment conveyor to their respective dense-medium processors. The 6 by 3-in. egg coal is separated at 1.60 specific gravity. Sinks and floats resulting from the separation flow to three 4 by 16-ft single deck "drain and rinse" vibrating screens which are mounted side by side in front of the processor. The rejects flow to the center screen of

the three used, and after the free medium is drained and the clinging magnetite is rinsed off, the sinks are dewatered and conveyed to a bin from which they are hauled to the gob pile by truck. Medium and 1.60 float

coal flowing from the processor are split into two equal portions by a simple splitter; one half is diverted to each of the two drain and rinse screens mounted on either side of the rejects screen. Draining medium,

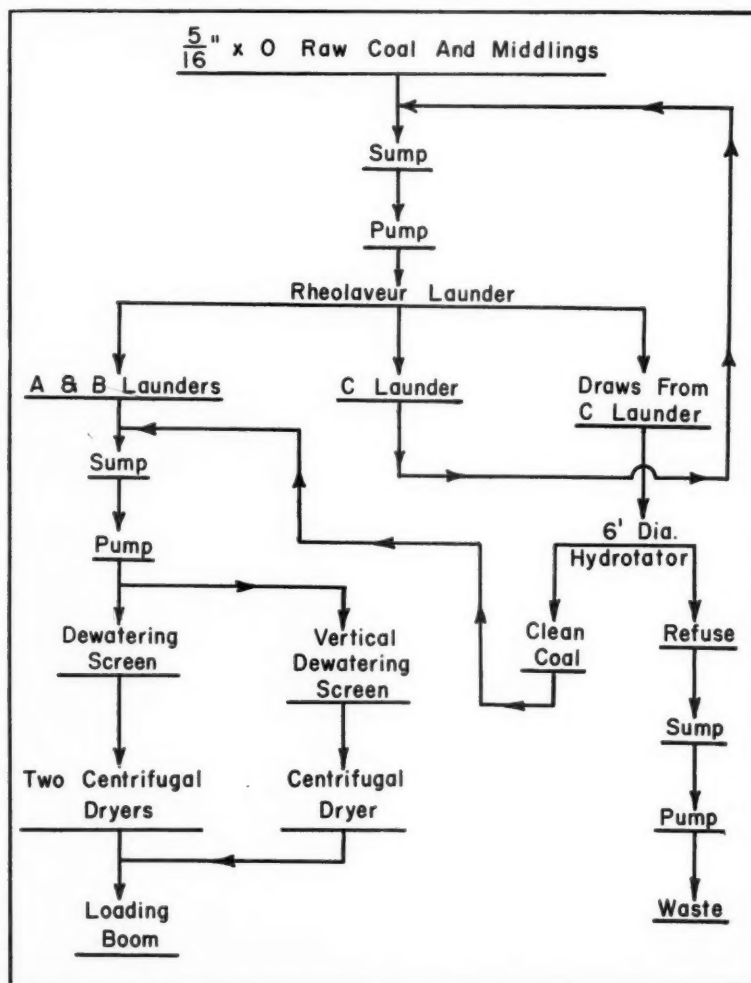


Fig. 2—Fine coal circuit of Buckheart plant

rinsing off magnetite, and final dewatering are handled in the same manner as for the rejects product. Facilities are provided for loading the 1.60 float coal directly as 6 by 3-in., or for crushing to screenings and loading as such.

Each of the heavy medium processing units is equipped with three 4 by 16-ft single deck screens. They are arranged and function as described for the flow of the 6 by 3-in. circuit. Drives for the screens are of the same size and type, and 2 by 4-ft stainless steel wedge-slot screens with one-mm. opening cover the decks throughout. Standardization of all the heavy medium drain and rinse screens has resulted in economies by permitting reduction of inventories of spare parts for the screens.

The 3 by 1¼-in. size is washed at 1.47 specific gravity. Float coal from this unit can be loaded directly as 3 by 1¼-in., crushed and loaded as screenings, or screened into stoker sizes. Sink material after draining, rinsing, and dewatering is crushed in a ring hammer mill to minus 1¼-in., screened to remove the 5/16-in., and rewashed. Two heavy medium processors are provided for washing the 1¼ by 5/16-in. size. They are arranged so that natural 1¼ by 5/16-in. and crushed 1¼ by 5/16-in. can be washed in separate units if required.

Date	6 by 3 in. #15 Processor		3 by 1¼ in. #16 Processor		1¼ by 5/16 in. #17 & #18 Processors	
	T.P.H. Clean Coal	Lbs. Mag. Per Ton Clean Coal	T.P.H. Clean Coal	Lbs. Mag. Per Ton Clean Coal	T.P.H. Clean Coal	Lbs. Mag. Per Ton Clean Coal
Jan. 3, 1956	225	1.1	282	0.6	210	1.1
4	236	0.9	293	0.9	220	1.7
5	238	0.0	272	0.0	200	1.1
6	213	1.4	277	6.0	208	0.0
7	246	3.0	297	0.6	225	0.7
9	266	1.3	281	1.6	210	1.2
10	271	0.6	312	1.3	240	0.6
11	258	2.2	290	0.0	220	0.0
12	245	3.2	304	1.5	230	1.6
13	240	0.0	280	0.0	210	0.0
16	220	1.3	256	0.8	190	0.0
17	225	0.8	280	0.3	216	0.8
18	240	0.0	273	0.0	210	0.0
19	256	1.0	302	0.3	230	0.0
20	235	0.8	288	0.8	216	1.0
21	242	1.2	292	0.6	220	1.3
23	261	0.8	285	0.6	214	1.4
24	250	0.5	275	0.0	206	1.1
25	267	1.5	300	0.8	220	0.7
26	223	1.8	260	0.6	190	1.5
27	246	1.5	264	0.5	210	1.2
30	267	0.6	290	1.1	218	2.4
Average	246	1.2	284	0.9	214	0.9

Table 1—Tabulation showing daily production of washed coal and magnetite consumption for the various heavy-medium processors in January

Current practice is to divide these products equally between the two processors in which the medium is maintained at 1.40 specific gravity. Float coal from the processors is combined with the minus 5/16-in. clean coal and loaded as screenings. Sinks are

and are combined with the minus 5/16-in. refuse and pumped to the waste and settling pond.

### Fine Coal Is Laundered

Figure 2 shows the arrangement of the fine coal plant. Here the natural 5/16-in. by 0 raw coal and the 5/16-in. by 0 from the crushed 3 by 1¼-in. sinks is collected in a large sump, from which it is pumped directly into the "A" launder classification section of the free discharge plant. Three launders, A, B, and C, stacked vertically in the conventional arrangement, are used. D and E launders have been omitted from the circuit. Overflow from A and B launders go directly to clean coal, overflow from C launder is recirculated, and the discharge from all the draws on C launder is flumed to a 6-ft diameter hydrotator. None of the draws from the free discharge plant report directly to refuse. Hydrotator washed coal is combined with A and B launder overflow as the final minus 5/16-in. clean coal, sluiced to a sump, pumped to two dewatering screens, and finally dewatered in three centrifugal dryers. Refuse from the hydrotator is combined with 1¼ by 5/16-in. heavy medium refuse and pumped to waste.

### Magnetite Recovery Simplified

The medium or "magnetite" recovery circuit has been simplified in that several of the conventional units employed in recovery circuits have been omitted. Figure 3 shows the abbreviated medium recovery circuit at the Buckheart plant. Rinse water containing magnetite from the various screens flows by gravity directly to a feed well attached to the magnetic separators. Each heavy medium unit is provided with two magnetic

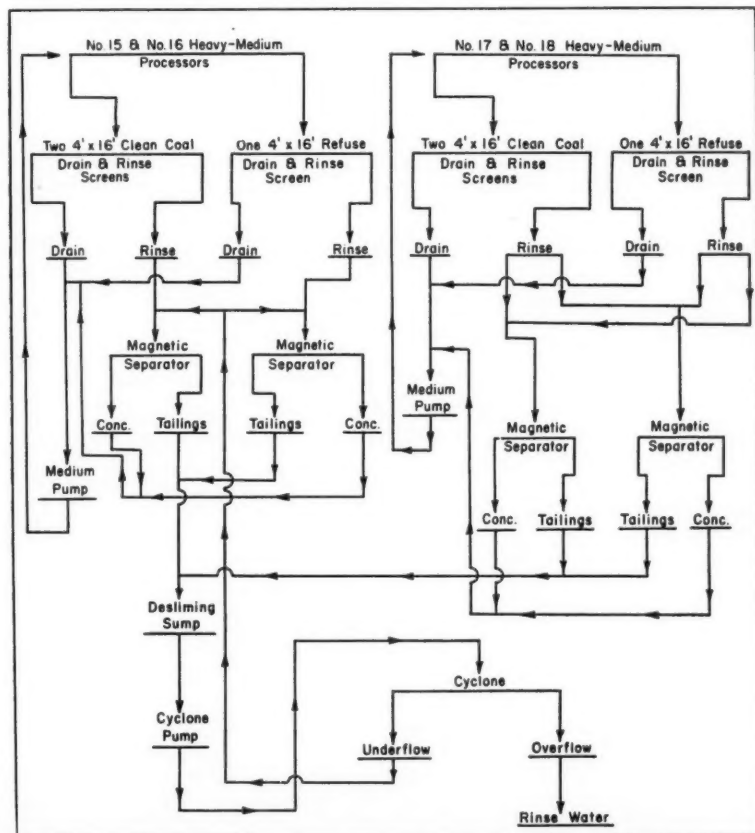


Fig. 3—Flow sheet showing circulation of separating medium



separators which return a concentrate of 2.2 specific gravity and about 95 percent magnetic content directly to the sump of the medium circuit without further treatment or handling. Tailings from all magnetic separators flow by gravity to a de-sliming sump. Here, utilizing upward current classification, the undesirable slimes are removed, and the underflow of this sump is pumped to two 12-in. cyclones. The cyclone underflow is added to the rinse water from the screens in the 6 by 3-in. and 3 by 1½-in. circuits, and is divided equally between the two magnetic separators serving the circuit. Overflow from the cyclone is reused as rinse water on various rinse and drain screens. Table I lists the average daily tons per hour produced by the heavy medium units together with the magnetite consumption.

Originally, the 6 by 3-in. and 3 by 1½-in. dense-medium circuits were provided with additional magnetic separators for the purpose of diverting medium from the bath circuit to them, and returning a concentrate of a higher specific gravity to the medium sump. This permitted the extra separator, within limits, to raise the

AVERAGE OF FOUR TESTS							
Hydrotator Washed Coal		1.35 Sink		Hydrotator Refuse		1.35 Sink	
1.35 Float	1.35 Sink	1.35 Float	1.35 Sink	1.35 Float	1.35 Sink	1.35 Float	1.35 Sink
% Wt.	% Ash	% Wt.	% Ash	% Wt.	% Ash	% Wt.	% Ash
97.7	9.8	2.3	26.7	11.3	15.4	88.7	32.5
TEST MADE JANUARY, 30, 1956							
1.40 Float	1.40 Sink	1.40 Float	1.40 Sink	1.40 Float	1.40 Sink	1.48 Sink	1.48 Sink
% Wt.	% Ash	% Wt.	% Ash	% Wt.	% Ash	% Wt.	% Ash
100.0	10.2	Trace	—	9.4	18.1	25.5	21.7
						65.1	61.9

Table II—Hydrotator results

density of the medium without addition of raw magnetite. After a short period of operation it was determined that it would not be necessary to maintain the magnetic separator for this purpose. As shown in the magnetite recovery flow sheet in figure 3, the additional unit was eventually placed in the circuit to improve recovery of magnetite. It has also aided in preventing viscosity problems with the medium, which at times presents a formidable problem due to presence of considerable clay in the raw coal feed.

Magnetite is added in the dry state to the medium circuit to replenish that which is being continuously lost. A small hopper with storage capacity

to hold a shift's supply is provided directly over the medium sump, and is equipped with a mechanically operated rotary feeder for addition of magnetite. Except for hoisting to the heavy medium floor and for make up to the medium circuit sump, all handling of magnetite is performed manually.

Washability data of the coal being mined at the time the plant was designed indicated considerable variability in quality for the different size fractions. For this reason the heavy medium plant was designed to wash separately the 6 by 3-in., 3 by 1½-in., and 1½ by 5/16-in. sizes. As presently arranged the heavy medium plant permits a maximum recovery of coal of the required quality. The consistent performance of the plant is shown in figure 4 which includes the tons per hour of raw coal feed and the daily deviation from the average ash content of the final washed products for the month of January 1956.

### Increase Fine Coal Recovery by 100 tpd

Limited storage capacity for run-of-mine coal formerly resulted in varying feed tonnages which contributed to coal losses in the fine coal plant because of disruption of the launder beds. Inclusion of the present hydrotator in the fine coal circuit has proven its worth during periods of low feed or shutdowns. Float and sink results on the present minus 5/16-in. refuse as compared to former fine coal operation indicates coal recovery amounting to an additional 100 tons per day. The hydrotator was installed with the purpose of "skimming off" of a low ash float coal from the rougher refuse product from "C" launder. The application has proven successful as is indicated in Table II.

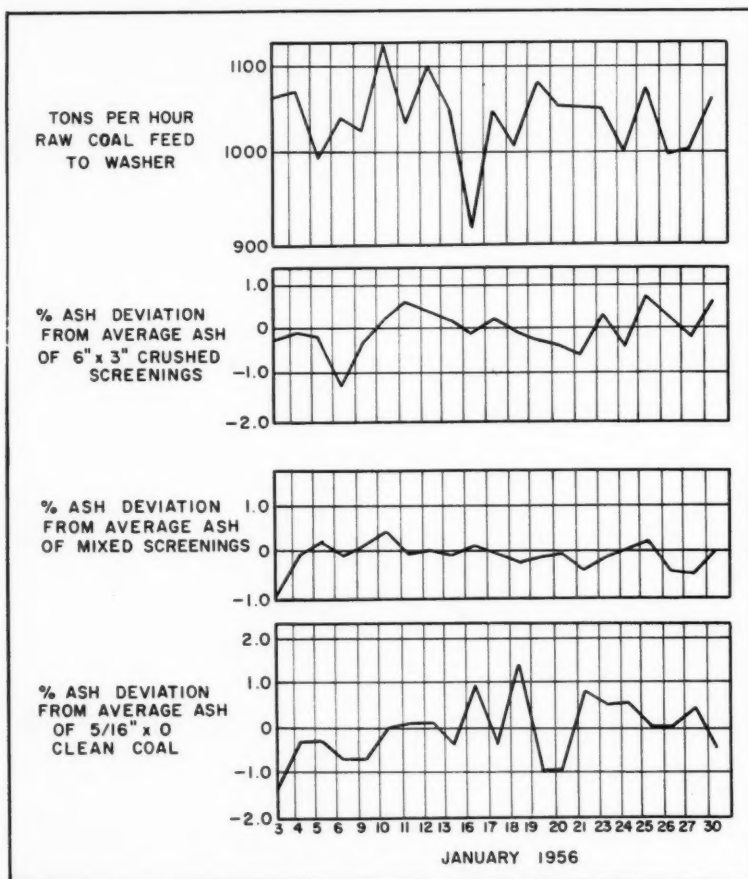


Fig. 4—Rate of washer feed and daily deviation from average ash content at the Buckheart plant for the month of January 1956



*Bucyrus-Erie Announces*

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Offered with either solid or  
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# This shovel is so

**It scoops up 90 tons  
of overburden in one bite**

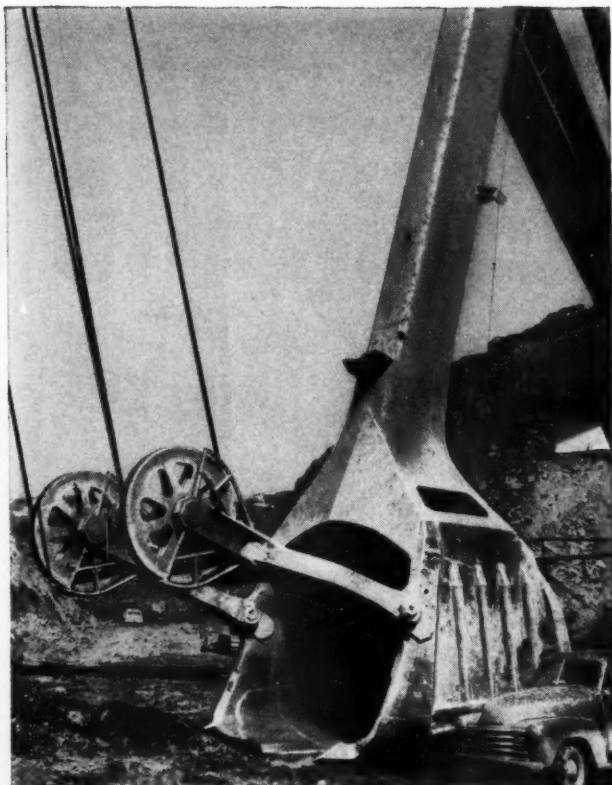
◀ **THE MOUNTAINEER**, "world's largest shovel," built by Marion Power Shovel Company for Hanna Coal Company Division of Pittsburgh Consolidation Coal Company.

**CHAMPION WEIGHT LIFTERS.** It takes only two 2½-inch Tiger Brand hoist ropes to transform the power of this huge machine into useful work. The boom is supported by four 3½-inch Tiger Brand Bridge Strands.





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You have to look at this shovel with your imagination—for your eyes will surely deceive you. The tip of the boom, for example, rises up as high as a 16-story building. The shovel has the power to lift a platform containing 166 1½-ton automobiles 100 feet into the air, swing them the length of a football field, set them down on top of a 10-story building, and swing back for another load . . . all this in 45 seconds!

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THE BIG DIPPER can scoop up 60 cubic yards of overburden, deposit it 290 feet away in piles 100 feet high. Tiger Brand Wire Rope provides the steel "muscles" that make it work.

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*Excellay Preferred*

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**minimum**

**end taper...**

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For all mining applications



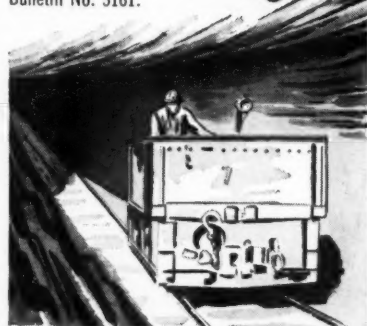
Actual photo taken during vibration torture test on an Ironclad Battery



Section of Ironclad positive plate

## Vibration can't loosen active material — can't shorten battery life

BATTERY FOR MINE LOCOMOTIVE. Exide-Ironclad Model MVM. Write for copy of Bulletin No. 5161.



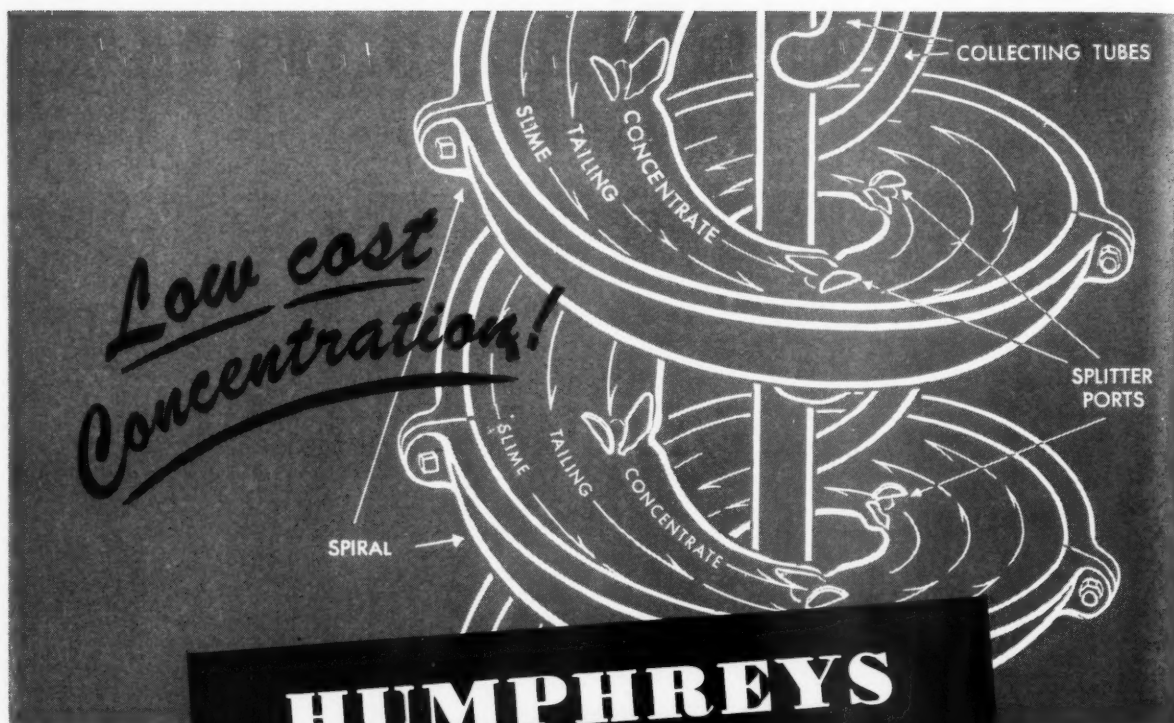
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But look what happens in an Exide-Ironclad Battery. Active material is held firmly captive inside the plastic power tubes. Hair-thin slits let electrolyte in, but keep active material from falling out. In prolonged vibration tests, this unique design has proved to be a valuable battery life stretcher. These findings are confirmed in the long, dependable service of Exide-Ironclad Batteries in typical high-vibration applications.

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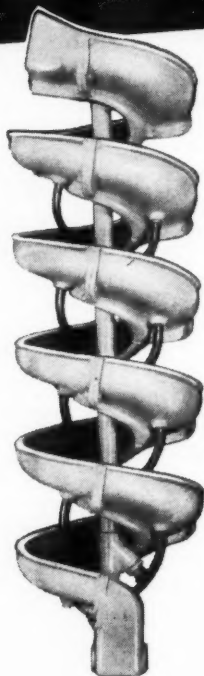




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Engineering Division

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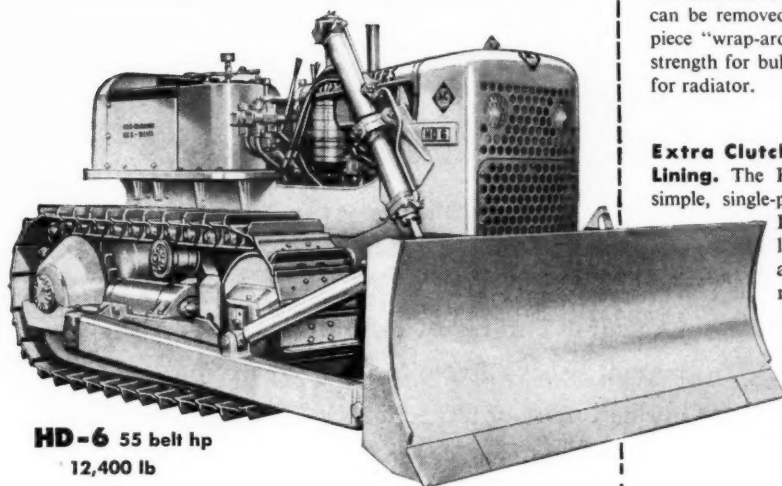
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# This kind of Crawler Tractor Design gives you extra mining output



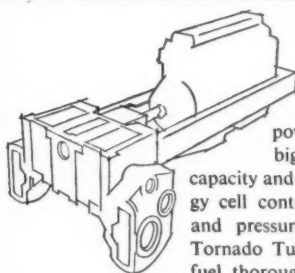
**HD-6** 55 belt hp  
12,400 lb

**... and only Allis-Chalmers HD-6 has it—**  
advanced design features that  
combine big performance,  
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Look at the Allis-Chalmers HD-6—you can see its functional design... how it's built to give sure-footed traction, better working balance. But there's more to this crawler tractor than meets the eye—the performance advantages of Allis-Chalmers advanced basic design. It provides more working power, more strength in all components, more working weight where it's needed... makes the HD-6 an outstanding performer with drawn or mounted equipment... easier to operate and maintain.

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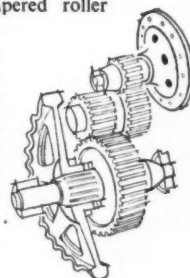
**Extra Clutch Life—with Ceramic Lining.** The HD-6 master clutch offers simple, single-plate, over-center design.

Revolutionary new ceramic button clutch lining keeps clutch operating longer between adjustments... lengthens clutch life... reduces lever pull for easier operation.



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Tapered roller bearings support both ends of the final drive gear shafts. Smaller gears and shorter shafts (plus line-bored, one-piece case), provide better bearing and gear alignment, more strength, longer life. Double-reduction final drives provide greater ground clearance.



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HD-6 track provides long life under the toughest conditions. HD-6 sidebars have more steel where it's needed... benefit from new heat-treating methods which make possible new standards of strength and hardness throughout for extra wearability.

## **Other Outstanding HD-6 Features**

... no other tractor in this size class has them—at no extra cost you get roller bearing truck wheels, idlers and support rollers; 1,000-hour lubrication intervals for truck wheels, idlers and support rollers; 24-volt direct electric starting; crankcase guard; bumper; and lights.

# ALLIS-CHALMERS



# Starting a New Uranium Mill



The Shiprock uranium concentrator went into operation during the winter of 1954-55

**Problems and Difficulties Usually Occur in Putting a New Mill into Operation. In Such a Youthful Industry as Uranium, Where There Is Little Past Experience to Draw on, this Discussion of the "Shakedown" at the Shiprock Mill of Kerr-McGee Oil Industries, Inc. Will be Particularly Valuable to Others**

MILLING operations of the Shiprock Mill officially started on November 1, 1954, when Kerr-McGee Oil Industries, Inc., took over the sampling and buying station from the Colorado Plateau Ore Project. This part of the operation was taken over without a ripple. The operating crew was trained and experienced—although supervisors had to be replaced because the former operator had transferred its men to Moab and White Canyon.

A few days later the rod mill was started along with the screens, dryer, conveyor belts, etc., to fill the ore bins with fine ore. Other than for the usual amount of adjustments and experimenting with rod load, there were no problems at first. The action of the rod mill while trying to grind a damper ore caused some concern. (Keep in mind that this is a dry-grind plant.) By using a thermal deck screen, it was possible to screen a fairly damp ore; so, in order to keep the dust to a minimum, we tried grinding slightly damp, that is, five to six percent moisture. This material would tend to pack in the mill

**By CLYDE E. OSBORN**

\* Formerly General Superintendent  
Kerr-McGee Oil Industries, Inc.

and the rods would ride high on the up-going side and drop with a thud. Fearful of knocking the mill off its foundations, we slowed the mill down about 15 percent and had no further trouble.

## Operating Personnel

One of the principal problems, one that faces any new milling operation, was developing an operating crew—recruiting and training mill operators, maintenance men, mechanics and electricians, accounting, office and warehouse people, chemists and laboratory technicians. The geographical location of the plant is an important factor in recruiting labor. It is also important in attracting supervisors, engineers, and skilled technical men.

The remote location of the Ship-

\* The author has since become a metallurgical consultant and is associated with Foley Uranium Corp.

rock Mill definitely limited the potential labor pool. It was impossible to attract any experienced mill operators from other localities. There were enough applicants (in numbers) to fill operators' jobs, but never enough of a backlog to screen them satisfactorily. It was a case of taking them as they come.

Housing was, and still is, a serious problem. We are situated on the Navajo Reservation where it is impossible at present to buy land; it must be leased from the Navajo Tribe. Consequently, it is out of the question to obtain financing for a housing project, or for an individual home for that matter. The importance of housing for employees cannot be stressed too much. Early surveys indicated that we would be able to recruit men (we were resigned to the fact that we would have to hire inexperienced men) from the nearby towns of Fruitland, Kirtland, Farmington and Cortez. At the time the survey was made the local service clubs and Chamber of Commerce were of the opinion that employees would rather



commute than live in Shiprock because of the schools, doctors, shops, markets, and other facilities available in these communities and lacking in Shiprock. As a result, it was decided to build only 20 housing units at Shiprock for "key" mill employees. An additional 25 or 30 units would have eased our labor problem. We have since learned that the men do not like to commute. This factor alone causes a large part of the labor turnover.

Fortunately, the valley along the San Juan River between Farmington and Shiprock is well settled with long-time residents. A fair proportion of our employees live in this area and do contribute a certain amount of stability to our operating organization.

Considerable time was devoted to labor because it was one of the most important problems that had to be dealt with during the first few weeks of operation. An ore concentrating mill will not run along without trained operators. The company had a few experienced mill men, Charles Lindberg, the mill superintendent, Eugene Woodward, plant metallurgist, Dr. Mayer Goren, chief research chemist, (Woodward and Goren had developed and checked much of the chemical processing), and two shift bosses with ore milling experience. Two other men were selected to act as shift bosses because of their experience in supervision and knowledge of mechanics. In the chemical laboratory was a very capable chief chemist, Dick Shreve. He had recruited some experienced chemists, so this department was pretty well staffed and has never been a problem. The accounting, purchasing and warehousing departments were also well staffed with experienced men drawn from the Kerr-McGee home office staff or recruited by them especially for the Shiprock plant. The mechanical and electrical departments were headed

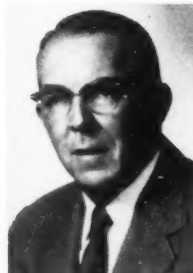
by qualified men, but both lacked ore milling experience. As mentioned earlier, we did have a nucleus of experienced men for the sampling and grinding plants. These men were all Navajos trained by the Colorado Plateau Ore Project.

For the processing mill operating crew, Navajos were hired in the helper and labor classifications and also as loader operators. These seemed to be the only classifications for which they qualified. We now have a few Navajos who qualify for higher classifications. In the processing sections of the mill all operators, helpers, and laborers were green at the start.

### Curing and Leaching

By December 1, we were ready to start curing ore, followed by leaching, sand-slime separation, and thickening. We started off cautiously and managed to get all the wheels rolling by staying on a one-shift basis to teach the operators and to allow all of us to get the "feel" of the operations. By this time freezing weather had closed in and we had to go on a three-shift basis sooner than desired in order to prevent a total freeze-up. Then things began to happen. Operator errors were common, and the freezing weather multiplied the difficulties. The major difficulty was "green" operators. The supervisors were standing 24-hr shifts. About this time the Grand Junction Operations Office of the Atomic Energy Commission suggested calling on the National Lead Co. at the experimental plant for some assistance. Accordingly, three experienced men were sent to Shiprock for as long as they were needed. These men reported a few days before Christmas, during a severe cold snap. They divided one man to a shift and in a week the situation began to ease. Our operators were learning and we were greatly encouraged. A few days after

### About the Author



Clyde E. Osborn, a native of Colorado, is a 1933 metallurgical engineering graduate from the Colorado School of Mines. His broad domestic and foreign experience includes mill design, construction, and operation and sales engineering. Osborn was employed as general superintendent of the Navajo Uranium Division, Kerr-McGee Oil Industries, Inc., from 1953 until he started his own consulting practice last December.

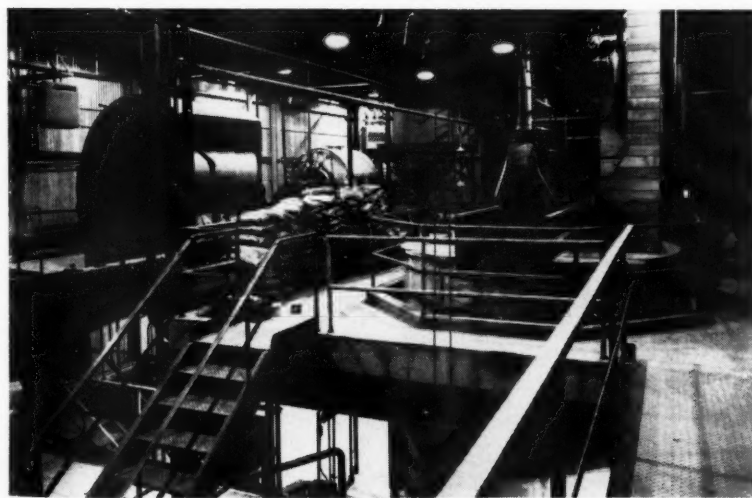
New Year's the men returned to Grand Junction. This timely and helpful service was greatly appreciated.

### Start Ion Exchange System

Up to this point, processing and mechanical problems have been covered but briefly because they were secondary in comparison to the labor problem during the first week or so. The Shiprock Mill employs an all sulphuric acid process with an ion exchange step to strip the uranium from the sulphate solutions. The Dorr Co. designed and supplied the equipment. Since there are but few men who have operated this type of equipment, the Dorr Co. sent three of their top-flight men to Shiprock to assist with the initial operations of this part of the mill and to instruct new operators. We selected some men from our roster who were considered capable of learning, and had very good results. Because of the many automatic controls, meters, and recording devices, it took some time to check this equipment for operation. It performed well from the beginning and, although some "bugs" developed, it was not too difficult to operate.

### Drying Yellow Filter Cake

The Dorrco men did a good job of training our operators. Two very capable men of the Kerr-McGee organization, Dr. Mayer Goren and Eugene Woodward had been assigned by Mr. McGee to make a study of the ion exchange methods long before



Filters and precipitation tanks

the mill was designed. They also had developed a method for the final precipitation of yellow ammonium diuranate which produced a granular salt that was easily filtered and washed. We encountered difficulty drying the yellow filter cake. The plan was to dry it on steam tables. But it gave up its moisture stubbornly, even after long periods on the steam table, so finally, gas-fired drying pans were installed.

The uranium processing methods proved successful from the beginning. Yellow cake was produced within four weeks after the first ore was started through the acid-curing section.

### Corrosive Solutions

The fight against corrosion is never-ending in an acid processing plant, especially when it is aided and abetted by abrasion. The plant was designed to prevent and combat corrosion. Rubber lining and rubber covering were used wherever the suppliers recommended it. Stainless steel was used for many applications such as the arms, clamps, and bolts on the sand classifiers, center walls on the thickeners, exposed parts of diaphragm pumps, and many other places. Plastic pipe, rubber-lined pipe, saran-lined pipe, and stainless steel pipe were all used—depending upon the application. Olivite and Worthite type pumps were used, the soft Olivite for combination abrasion—corrosion applications, and the hard Olivite and Worthite types for clear solutions. The selection between hard Olivite and Worthite depended upon the service required.

Most of the solutions in the plant are sulphates, some are chlorides, but all are acidic in nature. They carry varying amounts of other salts such as vanadium, iron, calcium, aluminum, etc. For tanks, we selected Douglas

fir for thickeners and precipitation tanks. Storage and holding tanks are steel lined with an anticorrosive coating.

A mistake during the designing of the plant was made in accepting the idea that present-day plastic protective coatings are a satisfactory solution to corrosion problems. They offered protection at less cost, especially in large tanks where there was no abrasion, and they could be applied in the field, but it has not proven to be wholly satisfactory.

Stainless steels classified as types 316, 317, and 347 stand up well to our sulphate solutions. They are poor in hot acid chlorides and are fair to good for neutral chlorides.

For transporting cold abrasive corrosive pulps, plastic pipe gave good service. It is also good for cold acid solutions, but is not satisfactory for temperatures about 150° F. Where temperatures are apt to vary from cold to warm, this pipe develops leaks at threaded and flanged connections. When the Shiprock plant was under construction, the atmospheric temperatures were in the 85°-100° F. range. When we started to use the plant, they were in the 10°-50° F. range. Every connection in the plastic pipe lines throughout the plant leaked and it was necessary to rework the entire lot. This was caused by the high coefficient of expansion. In spite of this, we are fairly well satisfied with the pipe and use it wherever we can.

### Time of the Year

Yes, the time of the year had much to do with the initial operations of the Shiprock Mill.

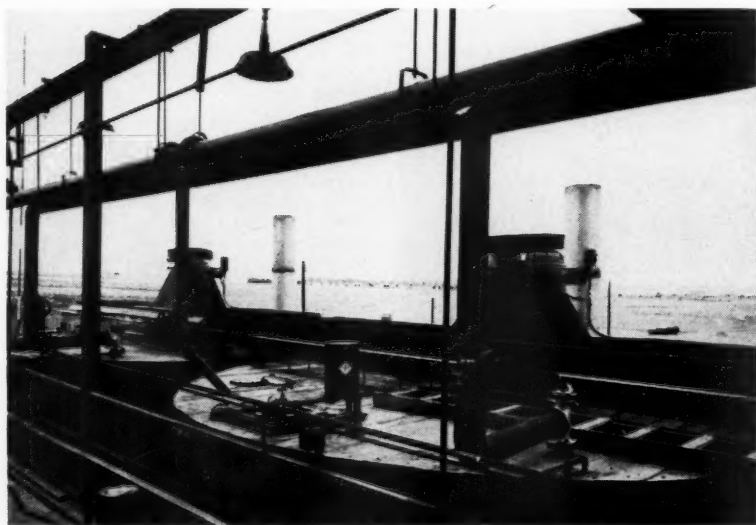
Starting up in November, there was hope for mild weather through December so that tanks could be filled and mill solutions started flowing before

any severe freezing took place. We were still experimenting with our water supply system too. The work was progressing on schedule when on December 3 the weather turned very cold. Although there was no damage by freezing, it was necessary to concentrate on the task of preventing lines, pumps, and tanks from freezing—which in turn hampered and even delayed certain phases of the operation. Several emergency measures had to be taken and the morale of the green operators dropped to a negative quantity.

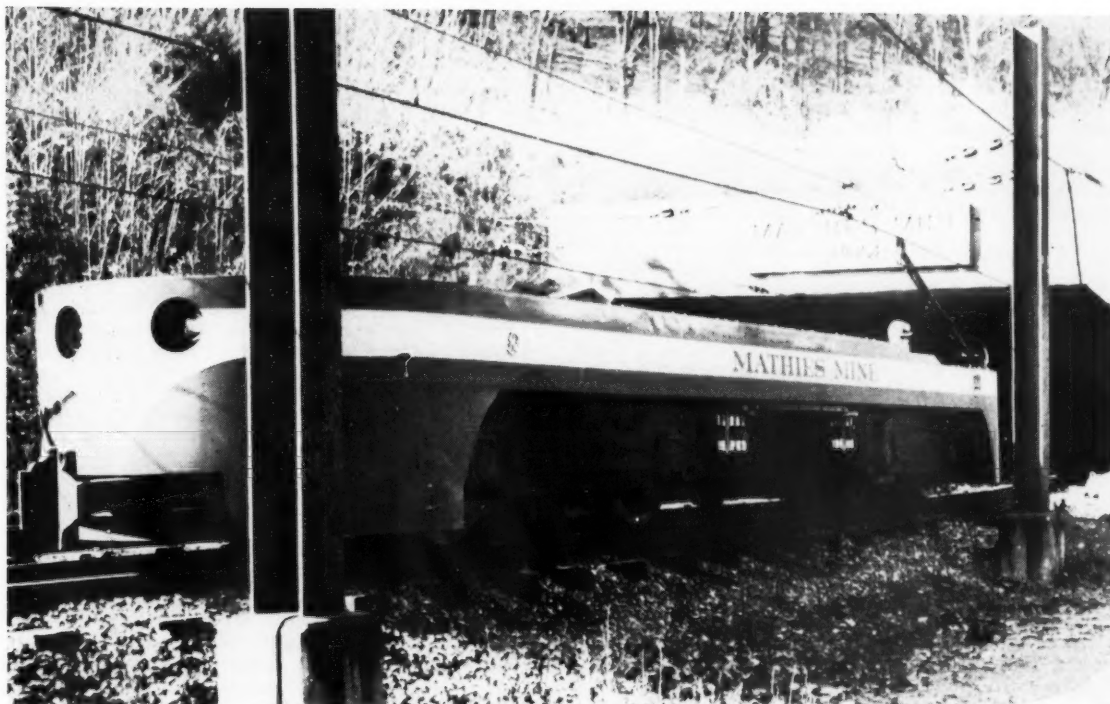
Most storage and holding tanks are out of doors—including the four 40-ft thickeners. Starting thickeners is always a touchy job because the discharge cone and pump lines become blocked with debris and sand. The green operators were afraid of the acid solutions and didn't relish this wet work in freezing weather. A few men quit, but the thickeners were finally put into operation. This is an illustration of how the difficulties normal to a start up can be aggravated by weather conditions. Had the plant operations started a few weeks earlier, we would have had less trouble. True, there would have been problems anyway when the cold weather did arrive, but the mill would have been better organized to cope with them.

The cold weather created other problems that had not been anticipated. After the severe cold snap early in December there was no real letup until early March. The temperature would drop to near zero each night. This caused mill solutions to chill to about 40° F., plus or minus a few degrees. In this temperature range the anhydrous ammonia, used to adjust the pH, would cause alum to precipitate and grow in the pipe lines and pumps, closing them completely. This was corrected slightly by raising the temperature with steam, which kept the alum in solution. But the heating caused excessive precipitation of gypsum, which presented a real tough problem. We struggled through this difficulty by periodically dismounting the pipe lines and pumps, cleaning everything including the tanks by strong arm methods. Considerable study has been put forth to solve the gypsum problem before another winter closes in.

This has covered some of the problems in starting up the new Kerr-McGee uranium concentrator at Shiprock. Many have been solved and others are near solution. Several visitors at the plant have remarked consolingly that we should see the trouble the other guy is having. The operators of the new uranium mills may not have the same problems that have been discussed above, because they will be using newer methods and different equipment; but they will have similar problems, and it is hoped that this report of the difficulties encountered at Shiprock will be helpful.



Outdoor tanks and pipes were subject to freezing in cold weather



Main line haulage without a motorman may not be too far in the future

# Automation of Mine Haulage

**Mining Industry Has Already Taken Advantage of Automation . . . Sequence Control of Belts and Automatic Hoisting Are Two Cases in Point. Future Holds Such Possibilities as Remotely Controlled Main Line Motors, Automatic Dumps and Full Mechanical Control of Railroad Cars Under the Tipple**



**By W. R. MORTON**  
Application Engineer-Mining  
General Electric Co.

AUTOMATION in any industry should be based upon sound economics whereby greater production, lower operating costs or greater safety result from the investment. One item of cost which is present in almost every industry, and which contributes nothing to the value of the product, is that of material handling. There is much that can be done by electric drives and control systems in the area of automatic material handling. The mine haulage system falls in this category and hence a look at the possibilities of automation here is in order.

In underground mining operations the actual mine haulage system extends from the working face to the point where the coal is loaded in the transportation medium which transports it to market. This concept of

the haulage system should be kept in mind when looking toward the ultimate goal of "complete" automation. At the present time there are certain phases of the haulage system which can readily be made automatic and there are possibilities of future steps which may be tried. Following is a discussion of some of the currently available automatic schemes as well as some future possibilities.

## Section Operation

The logical place to start considering the haulage system is at the working face. The various forms of continuous mining machines which are currently available form the first link in the automation of the haulage system. They remove coal from the face and convey it to the rear of the ma-

chine ready for transfer to the next phase of the haulage system. The continual advancement of the face and hence the continual change needed in the haulage system, to obtain the ultimate capability of the continuous mining machines, presents one of the major problems. Ultimate solution of this problem will require a combination of mechanical design and closely coordinated mining plan which is beyond the scope of this paper.

After the coal is removed from the working area and transported to the more permanent section of the haulage system there is a choice of using



track haulage, conveyor haulage, or a combination of both. Selection of the best system to use depends upon such factors as grade, length of haul, tonnage to be handled, etc., and hence what is most economical for one mine may be very uneconomical for others. However, once a system has been decided upon there are some possible steps toward automation.

### Conveyor Haulage

When conveyor haulage is used, the electric control can be designed, as shown in figure 1, to provide sequence starting from one point and include provision for such protective devices as emergency stop stations, belt slip switches, and spill switches. The circuit shown is arranged such that only four color-coded wires are required between each of the main conveyor motor starters and only two color-coded wires are required to the entry conveyor starters. Provision is also made for removing a unit from sequence for test purposes. When a unit is removed from sequence, those units which feed on it are automatically stopped. Pressing an emergency stop button along one of the main conveyors will automatically stop that conveyor as well as those that feed on it. The circuit shown in figure 1 does not indicate all of the possible arrangements but is merely intended to show what can be done.

### Combination Conveyor and Rail Haulage

In some instances it is desirable to use conveyors for the first part of the haulage system and rail haulage for

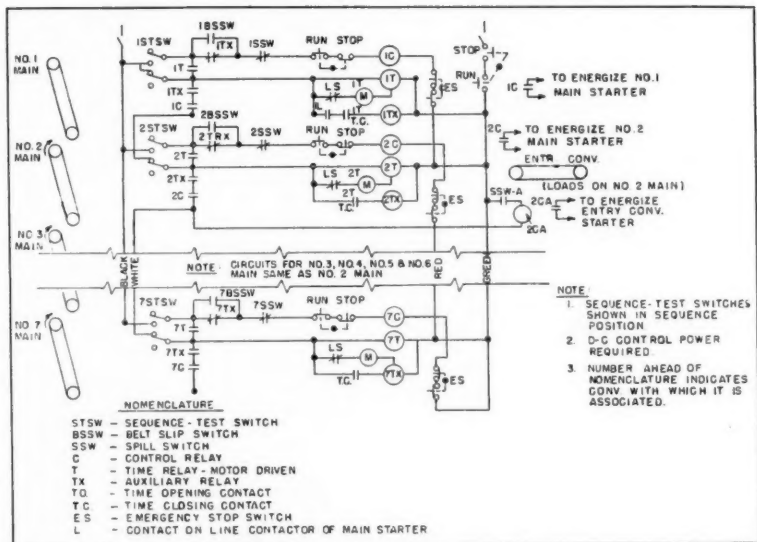


Fig. 1—Automatic sequence control for a conveyor system

the remainder. In such cases the conveyor would be discharging into mine cars at the designated loading point. Then, automatic loading of the mine cars is practical. Figure 2 shows a possible control circuit for use in conjunction with the conveyor sequence control of figure 1. The control is so arranged that the conveyor will load into the mine car with the coal gradually building up in a pile until the pivoted ball is contacted causing it to move toward the outer edge of the car. The pivoted ball causes limit switch LS3 to close its contacts, causing the trip feeder to move the cars

forward. When the roller on limit switch LS1 falls into the opening between cars the main conveyor is stopped and the trip feeder continues moving the cars. Stopping the feed conveyor prevents spillage between cars. However, in order to prevent stopping the complete system, relay 1TA bypasses the contact of 1L in the 1TX circuit of figure 1 for a short period of time. If some failure caused the cars to stop with contacts of LS1 or LS2 open, relay 1TA would time out and stop the rest of the conveyor system. The roller on limit switch LS2 will fall into the opening between cars before LS1 is reset and cause the cars to continue moving even though LS1 is engaged by the next car. Limit switch LS2 will stop the feeder and allow the conveyor to restart once it is operated by the next car to be loaded.

### Remote Control Main Line Haulage

The conventional system on main line locomotive haulage involves the services of one or more locomotive operators and a dispatcher. Presently used mine trolley phone systems have been very valuable in making this team function smoothly. The apparent success of transmitting communication signals over the trolley wire, especially along the main haulageway, leads to the thought of the future possibility of the dispatcher remotely controlling the locomotives. Figure 3 shows, in brief form, the parts needed in such a system. Control initiation for the various functions on the locomotive might well be handled by a system using a carrier frequency modulated by audio tones. These signals would have to be coupled to the mine trolley system and received at the locomotive through the trolley-pole in



Sequence control of belts is only one way in which the mining industry has applied automation to haulage



a manner similar to the present communication system. Use of two simultaneous audio tones for each function to be performed would essentially eliminate false signals because of the unlikelihood of two accidental frequencies appearing on the trolley line at the same time. Equipment mounted on the locomotive would receive the transmitted tones and actuate a relay to initiate the function on the locomotive.

There are some conditions which might make such a system impractical or undesirable. First of all, it may not be practical to make the sensitive relays needed in the receiver work satisfactorily on the locomotive because of vibration. Second, the condition of the trolley system, particularly the insulators, can affect the transmission range. Insulators coated with coal, rock dust or moisture can cause quite a loss of signal.

Last and by no means least is the matter of operating the locomotive without "sight." Use of closed circuit television would not be practical at this stage because of the need for the coaxial cable between the camera and receiver. Hence roof falls or other obstructions on the track would not normally be known to the dispatcher unless the matter was reported to him.

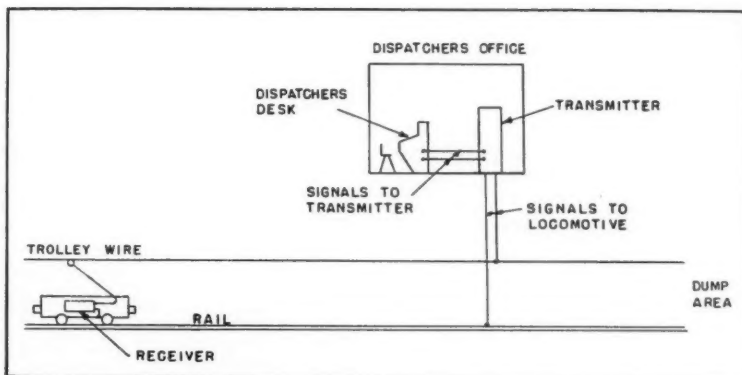


Fig. 3—Remote control for locomotive operation

While a remote control system such as this for mine locomotive operation is not currently available or in use, it does bear consideration for the future. It would appear that such systems would be most applicable on the main line haulage from a central collection point out to the mine car dumping point. Operation of locomotives from the section loading point out to the dumping point would present many more problems such as operation of track switches, air doors, etc.

## Automatic Rotary Dumps

Where rail haulage is used to bring coal to a transfer point it is common practice to use rotary mine car dumpers. Cars are fed into the dump by some form of trip feeder. Operation of the rotary dump and trip feeder can readily be coordinated automatically. The initiation of the operation can be obtained by the tripping of a limit switch indicating that loaded cars are in position for dumping, at which time the dumping cycle is initiated. At the completion of the dumping cycle the feeder is again energized to position the next car for dumping. Protective interlocking can be put into the circuit so that the dump will not operate if the hopper is full or if the feeder below the hopper is not operating.

## Automatic Hoists

In shaft mines coal is usually dumped into hoppers either from the rotary mine car dumps or from conveyors, for loading into hoist skips. In these shaft mines the hoist should be considered a part of the haulage system. Automatic d-c mine hoists have gained in popularity in recent years and current developments offer possibilities of converting some of the existing a-c manual hoists to automatic operation.

A full evaluation of automatic hoists could well be the subject of a complete paper and hence cannot be covered here. However, some of the less obvious advantages of automatic hoisting do bear mention. One of these is the increased production which can be obtained by the continuously repeating cycle of operation which can be obtained by the programming of the hoist. The automatic hoist is not subject to the physical fatigue or necessity for relief of discomfort that is encountered with human operation.

Continual repetition of the hoist cycle to a fixed pattern also leads to longer rope life on the hoist since the ropes are being stressed within the same limits on each cycle and not sub-

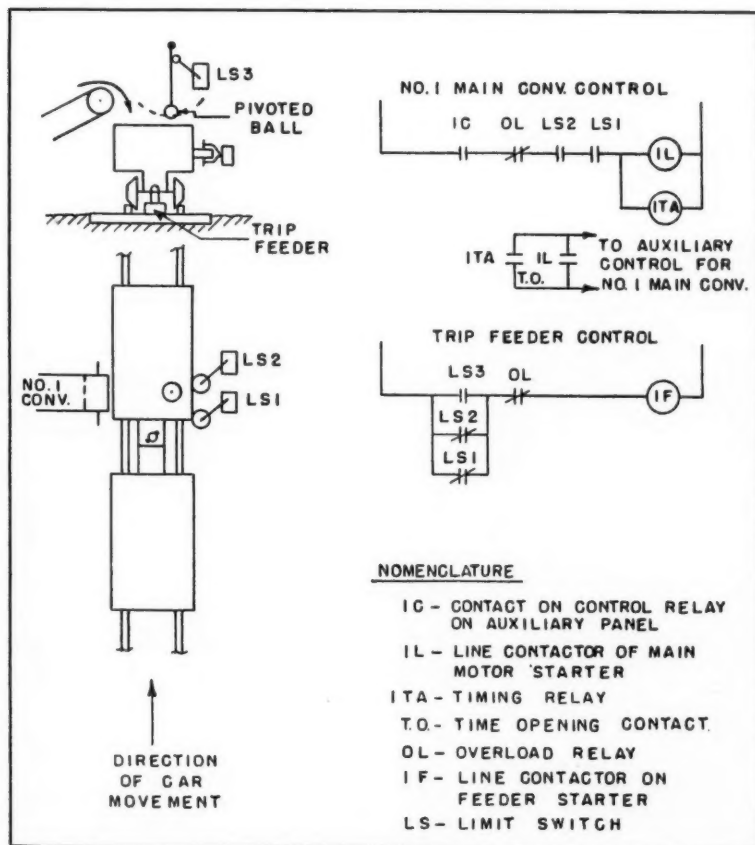


Fig. 2—Automatic mine car loading control

jected to some of the sudden shocks which might occur with manual operation.

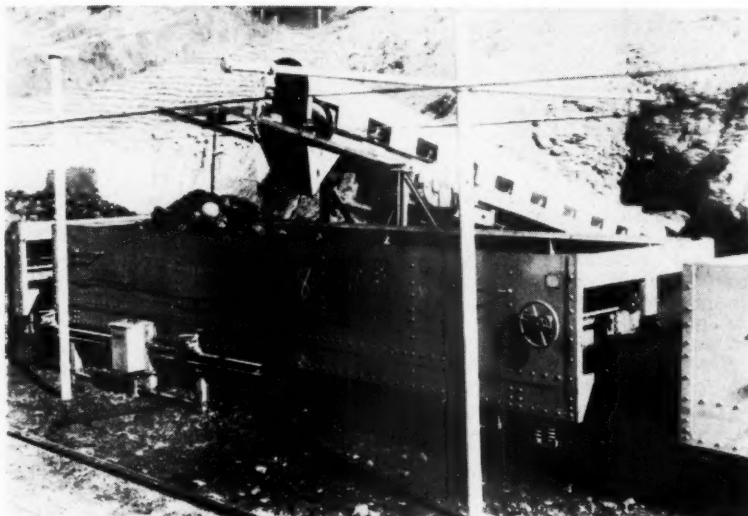
### Preparation Plant

Many consider that once the coal has been brought to the surface that the haulage system is completed. In reality, however, there is a considerable amount of haulage involved in the modern preparation plant. In order to have a smooth flowing haulage system from the face to the surface, it is important that the movement of coal through the preparation plant be closely coordinated with the flow of coal to the plant. This will become increasingly important as the goal of continuous mining is approached.

Well designed preparation plants of today provide sequenced operation of the various phases to eliminate costly and time consuming pileups of coal which might occur if one of the components in the plant flow should stop and the feeding of coal to that component was not stopped. The use of parallel paths in some cleaning operations with provision for bypassing coal from one of these parallel paths, which may be shut down for necessary maintenance, leads toward better continuity in the over-all flow of the coal throughout the mine.

### Automatic Bin Loading

Some preparation plants have multi-pocket bins either for coal storage or for blending of coal. Here again, automatic operation of the loading of the bins is very practical. The degree of complexity of the automatic loading of bins will depend upon the number



Automatic loading and handling of mine cars, first used outside, has gone underground at an Eastern Kentucky coal mine

of bins and the type of loading desired. The point to be made here is that such controls can be made and bear mention as one of the possible links in the long range approach toward the ultimate goal of complete automation.

### Railroad Car Movement

After coal has been sized and cleaned there is one remaining portion of the haulage system, that is, the loading of railroad cars and the moving of the cars to the accumulation area. Since the movement of cars from the cleaning plant to the ac-

cumulation point is by gravity, it is usually necessary to have a fairly good grade to maintain motion in real cold weather. This presents a problem of having personnel available to operate the brake hand wheels to control the speed of the car down the grade. It would appear that a development would be in order to provide a vehicle capable of controlling several railroad cars at one time on the route to the accumulation point and then quickly returning to handle a new batch of cars. Such a vehicle might readily be adapted for remote control operation. While such cars are not currently being used they are a possible future development.

### Summary

In considering the broad aspect of the mine haulage system, it would appear from the foregoing discussion that there are many places where steps can be taken today toward the ultimate goal of complete automation. Some have already been taken. Like Rome, automation is not built in a day. Only by gradually upgrading each phase of the over-all system from the hand stage to the mechanized stage, and finally to the automatic stage, will we ever reach the goal of complete automation in the over-all mine haulage system.

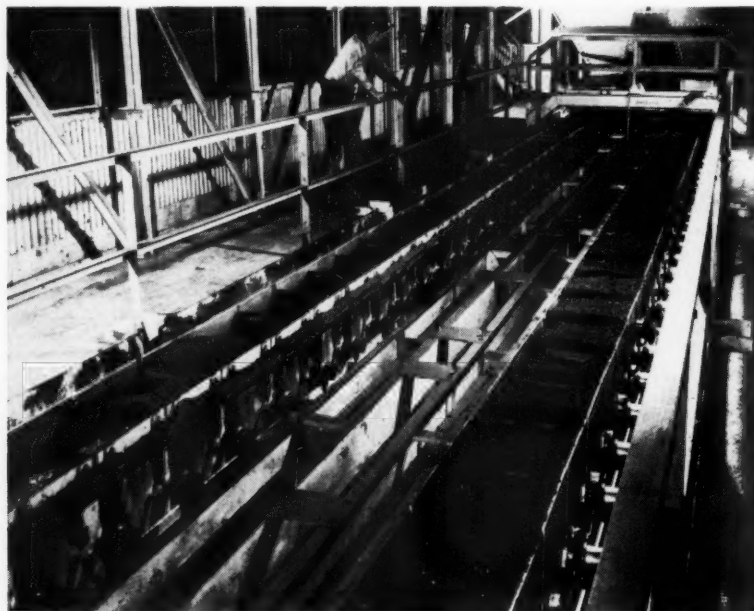
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### Did you miss the Coal Convention at Cincinnati?

The JUNE ISSUE of Mining Congress Journal will carry a complete review of this important industry meeting.

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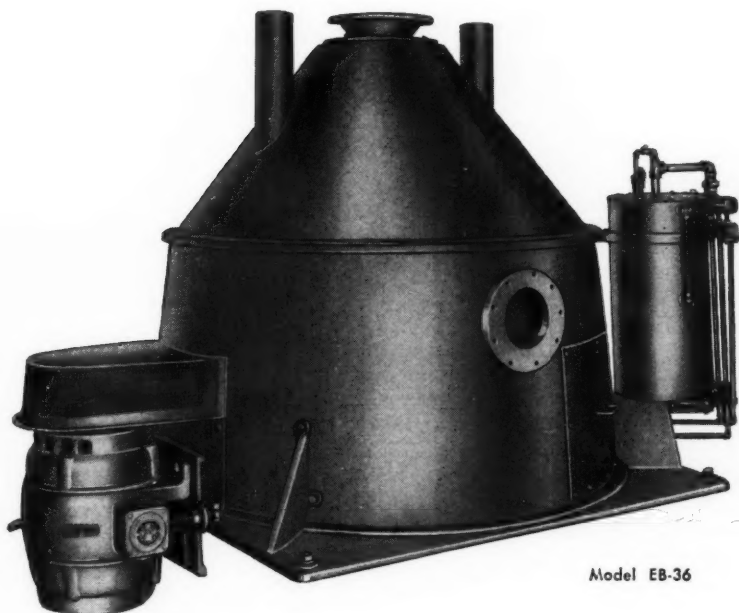
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Still part of the haulage system, many coal handling functions in the preparation plant have been made automatic

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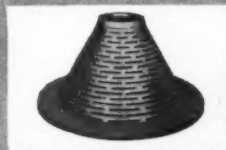
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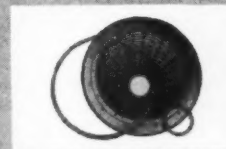
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# Background for Exploration In the Colorado Plateau

**Although There Are Many Unanswered Questions Concerning the Occurrence of Uranium Ores, Geologists Have Acquired a Wealth of Information in the Several Recent Years of Uranium Exploration. Here Is a Summary of the Most Significant Developments**

By RALPH H. WILPOLT

Manager  
Southern Division  
Cullen Minerals Corp.\*

THERE have been three major periods of exploration for unusual minerals in the Colorado Plateau during the past 50 to 60 years. The first period was for radium and followed Madam Curie's isolation of this element in 1902. Competition from the high-grade radium ore of the Belgian Congo terminated this search. The second major period of exploration occurred during and shortly after World War I when vanadium was sought for use in steel alloys. The current quest for uranium is the third period of exploration.

The search for uranium in the United States began in the early 1940's under the administration of the "Manhattan Project." A small tonnage of uranium concentrates was recovered during World War II from the tailings of previous vanadium operations. By mid-1945 most of the known vanadium producing areas had been examined for the presence of uranium, and the necessary equipment for the production of uranium concentrate had been added to existing vanadium mills.

The Atomic Energy Commission, including its Division of Raw Materials, was created as a result of the "Atomic Energy Act of 1946." The Division of Raw Materials and the U. S. Geological Survey have since carried out an extensive geological program, involving field and laboratory studies as well as several million ft of explorational and developmental drilling. This government-sponsored program for a single element has been the greatest geological and explorational effort in the history of man.

\* Previously Deputy Director, Exploration Division, Atomic Energy Commission.

Since discovery of the relatively large and rich Steen Mi Vida Mine and the Pick Delta Mine in 1952 with accompanying publicity, private industry has entered the uranium business on an extremely large scale. As a direct result of this increased private activity the government has decreased its drilling activities and is concentrating on the scientific aspects of uranium exploration.

At present there are 12 mills processing uranium ore or under construction in the Plateau, and negotia-

tions are being carried on by the Atomic Energy Commission for the construction of several more. The location of the mills, buying stations, and principal mines is shown on the accompanying map.

After the Steen and Pick discoveries, the uranium industry experienced a tremendous boom which caused property values and royalties to soar to unheard of prices. It seems now, however, that the business is gradually stabilizing and many of the unstable organizations and companies are failing or being absorbed by larger or better managed corporations.

## General Geology

It is now thought by many geologists that the carnotite of the Colorado Plateau deposits is only a near surface oxidation product resulting from the weathering of primary uraninite and other dark uranium and vanadium minerals. The ore minerals occur as disseminations in tuffaceous, arkosic, and quartzose sandstones and conglomerates, as replacements and associated with carbon trash, logs, and clay galls. Various combinations of uranium, vanadium, copper, or silver are found in the deposits and minute amounts of molybdenum, cobalt, nickel,

TABLE I: URANIUM-PRODUCING ROCK UNITS OF THE UNITED STATES

This table lists the approximate percentage that the major ore producing rock units comprise of the total United States production of uranium oxide from July 1, 1953, to June 30, 1955. (Based on tons of ore and estimated grade.)

Unit	Region	Percentage
Morrison formation		
(Salt Wash member)	Colorado Plateau and some from Wyoming	39.0
Chinle formation	Colorado Plateau	24.0
Shinarump conglomerate	Colorado Plateau	16.0
Morrison formation		
(Brushy Basin member)	Colorado Plateau (New Mexico)	9.8
Todilto limestone	Colorado Plateau	7.2
Vein deposits	Western United States	1.7
Inyan Kara group and		
Dakota sandstone	Black Hills and Colorado Plateau	1.6
Fort Union formation	Wyoming and the Dakotas	0.2
Wind River formation	Wyoming	
Morrison formation		
Recapture shale and		
Westwater Canyon		
sandstone	Colorado Plateau	
Entrada sandstone	Colorado Plateau	0.5
Dripping Springs quartzite	Southern Arizona	
Cutler formation	Colorado Plateau	
Deer Trail argillite and		
Loon Lake granodiorite	Washington	
Others*	Colorado Plateau and New Mexico	Trace

\* Includes the Wingate sandstone; Uinta formation; Mesaverde group; Brown's Park, Santa Fe, Bidahochi and Hermosa formations.

After Wood, H. B., "Age and environment of uranium host rocks in the United States," prepared for the United Nations, Paper No. 30, International Conference on the Peaceful Uses of Atomic Energy, Aug. 1955.

lead, zinc, selenium, arsenic, and other elements are also present.

The ore commonly occurs in lenses of sandstone and conglomerate, many of which are fossil stream channels. Orebodies are generally tabular and are elongated parallel to the major axes of depositional lenses. Individual deposits range in size from a few tons to over 1,000,000 tons. Most ore is mined from sandstone which has the following characteristics<sup>1</sup>:

- a. Fluvial origin.
- b. Light colored or gray; not red.
- c. Contains carbonized plant matter.
- d. Contains feldspar and/or mica.
- e. Interfingers with or is interbedded with shale or mudstone.

Most of the deposits are near major structural features but the influence of structure is not fully understood. In the Grants, New Mexico, district, uranium deposits in the Tordito limestone occur along fractures. Deposits are found in some areas in the vicinity of alkalic laccolithic intrusives as in the La Sal, Henry and Carrizo Mountains.

Geologists are still debating the genesis of the uranium ores. The isotopic age determinations indicate a late Cretaceous or early Tertiary age for the Plateau deposits and also the Front Range vein deposits. In contrast, the age determinations indicate a late Tertiary age for the Marysvale, Utah vein deposits. The various hypotheses were listed recently by McKelvey<sup>2</sup>:

- a. Placer concentration of the chief ore minerals, followed by recrystallization and some redistribution.
- b. Precipitation from solution at time of deposition of enclosing sediments, followed by recrystallization and some redistribution.
- c. Derivation from volcanic tuffs or other sediments associated with the ore, as the result of weathering and ground water action, after the enclosing rocks were deposited.
- d. Derivation from petroleum source beds.

## About the Author



The author has had 20 years of wide experience in his chosen field, geology. His professional career started with five years' employment with the U. S. Geological Survey, after which he worked for the American Smelting & Refining Co. in Mexico, the Clinchfield Coal Corp., and the Sierra Ancha Mining Co. Returning to the Government, he was chief of the Geologic Branch and Deputy Director of the AEC's Exploration Division at Grand Junction, Colo. Also an educator, Wilpolt has been an associate professor of geology at the New Mexico School of Mines, and he is a Fellow in the Geological Society of America.

- e. Precipitation from hypogene solutions, possibly injected into circulating ground waters after the enclosing rocks were deposited.

Garrels and Richter<sup>3</sup> have recently suggested that juvenile carbon dioxide might have been a transporting medium. It may be noteworthy that there is an unusually large number of carbon dioxide wells in the Plateau.

The wide stratigraphic distribution of ore on the Colorado Plateau is shown by the fact that ore has been produced from at least 20 formations ranging in age from Permian to Tertiary. Table 1 shows the relative importance of the principal producing formations in the Plateau and in the remainder of the western United States during a recent two-year period. The greatest part of the production from the Salt Wash member of the Morrison formation comes from numerous uranium-vanadium mines in the Uravan Mineral Belt. The recent discoveries of ore in the Grants, New Mexico, district, in members of the Morrison formation other than the Salt Wash, such as the Westwater, sandstone member, will change the percentages shown in the table con-



Location of principal mines, uranium mills and buying stations of the Colorado Plateau

<sup>1</sup> Wright, Robert J., "Where to Look for Uranium"; E. & M. J., Vol. 155, No. 9.

<sup>2</sup> McKelvey, Vincent E., "Search for Uranium in the United States," U. S. G. S. Bull. 1030-A.

<sup>3</sup> Garrels, R. M., and Richter, D. H., "Is Carbon Dioxide an Ore-forming Fluid under Shallow-earth Conditions?", Bull. Econ. Geol., Vol. 50, No. 5.



Mine personnel study structure in underground uranium development. The influences of structural features is not clearly understood

derably. The present reserves of the Grants district are probably greater than those of any other district in the United States, having been increased recently by the Ambrosia Lake discoveries.

## Prospecting Methods

For years the conventional prospecting method of examining outcrops was used in the Plateau. Development of the portable Geiger counter greatly improved the efficiency of this method. Small airplanes carrying scintillation detection equipment and flying 50 to 100 ft from the rims have enabled prospectors and geologists to cover much more area than the man on foot or horseback.

More careful geological study of rock color alteration, of sedimentary structures such as fossil stream channels, and of tectonic structures has led to somewhat more systematic discovery of ore.

Application of any of the above or other methods has led to intense drilling activities in the Plateau. Hundreds of core, rotary, and wagon drills are now being used and numerous different types of Geiger and scintillation counters are used in drill-hole logging. Drilling depths range up to 1000 ft. Due to the fact that most of the radioactivity detected does not come from uranium itself but from its radioactive decay products, such as radon and radium, complications arise because the decay products sometimes are separated from the parent uranium. However, even radioactivity from such decay products usually indicates the presence of uranium in the vicinity.



The portable Geiger counter greatly improved prospecting efficiency as compared with conventional methods of examining outcrops

Conventional resistivity, seismic, and electric logging methods have been tried on the Colorado Plateau. Although these methods do not find uranium directly they may serve to locate buried structures such as fossil channels or favorable stratigraphy.

For a recent summary, complete with a list of the major geological contributions, the reader is referred to a geological report by Vincent E. McKelvey entitled, "Search for Uranium in the United States." This report was published in 1955 as U. S. Geological Survey Bulletin 1030-A.

## Radio Communications

(Continued from page 43)

switches and signals which ordinarily direct trains into and from the mine without the necessity of verbal orders or the use of switchtenders, there are eight diesel-electric locomotives in service that operate part of the time over a secondary track system that is not equipped with such signals. Radios were installed on these locomotives to improve the dispatching when they were not on the signal-controlled track. Delay time formerly used to stop and telephone for instructions has been eliminated. Other benefits have also been derived from these installations such as quicker reporting of derailments.

## Greater Safety

Blasting operations have been made safer through use of radio, and delays to other operations because of blasting have been decreased. Information regarding a blast is easily relayed to the foremen of all operations that may be affected by it. Clearing of the blasting zone can be done quickly and interruptions to other operations can be kept to a minimum. In cases where the area to be cleared is very large, the use of radio by the blast watch-

men has been extremely useful. Other phases of safety have also been served in cases of emergency.

Power failures at the mine are very costly as they usually affect a large portion of the operating equipment. Often, the cause is not observed or known, and isolation of the fault is a matter of trial and error. To coordinate the work of electricians in the mine with those at the power house, the use of radio has proved invaluable in these cases.



General mine foreman talking on radio from pickup truck

## Disadvantages

Considering the many benefits we have enjoyed through use of radio, the disadvantages or problems are relatively insignificant. However, there are a few.

Men with the special technical training required for satisfactory maintenance of two-way radio equipment have not always been available. At one time it was necessary to pack our units in special boxes and send them to Tucson, a distance of 135 miles, for periodic inspection and repair. At present, a radio technician living 40 miles from Ajo makes approximately two trips per week to the mine for maintaining the sets.

Since all equipment was not purchased at the same time, certain changes in radio design and tube requirements have had an adverse effect on interchangeability of the units and their parts. Also, the recent change from 6-volt to 12-volt batteries in pickup trucks has had a similar effect.

It has been well advertised during the past several years that the premature detonation of an electric blasting cap by a nearby radio transmitter is a possibility to be guarded against. With the relatively low power we use, this possibility is remote and the observance of a few simple rules will eliminate the hazard completely.

# Roof Bolting Procedures



One company, spending over \$15,000 monthly on roof bolting, set up an education and control program with an engineer in charge to get the most out of its investment

## AMC Committee on Roof Action Shows by Example the Value of Training Programs and Engineered Procedure in Making Roof Bolting Return Bigger Dividends

By R. J. FLETCHER, E. M. PACE  
and ORVAL ROBSON

IN THE space of a few years roof bolting has skyrocketed to the extent that over 3,000,000 roof bolts are installed in domestic coal mines monthly. During this mushrooming period mine operators were chiefly concerned with two questions—will roof bolting work, and does it offer an advantage over conventional timbering methods? Now that roof bolting has proved itself a capable tool, a closer look is being taken at the various bolting operations. At present a “diamond in the rough,” mine management hopes to make roof bolting a more exact and, especially, a more economical function.

A good training program for roof bolting personnel is certainly one way

to improve bolting practices, and would need to include such topics as tools, i.e., bits and drill rods, maintenance and operation of machines, and safety.

Tools are of necessity a key part of a bolting operation; hence they should be an important segment of any training plan. Many things must be adjudged. In determining the proper lengths of drill rods, it is important to keep them as short as possible for greater strength. Conveyor-type augers are needed for rapid drilling to eject material. To determine proper carbide and design, we must look to the bit manufacturer for help. An investigation of thrust pressure and

rotational speed in regards to maximum penetration and minimum bit wear will prove valuable. Advantages of two sizes of bits to reduce wear through loss of gauge and to speed up drilling should be noted. And last but not least, a bit sharpening record, properly set up and analyzed, will yield much useful data.

As with other mining equipment, maintenance can well influence the economy of the operation. Some suggestions that a person in charge of this phase of the program may wish to follow are: (1) have the maintenance superintendent and equipment manufacturer determine proper pressure adjustments for machine—check regularly and adjust pressures for changes in roof conditions; (2) give machine standard maintenance at time of each greasing, etc.; (3) work with foremen and drillers to keep drilling machine clean.

Good drillers are made, not born. The operation part of the training should include showing a driller the relationship of thrust and rotation to penetration and bit wear. If possible, a company should have a manufacturer explain operation of the equipment to the maintenance superintendent.



ent, foreman, and driller, and proper operation should be made a foreman's responsibility.

Safety of roof bolting is dependent on proper installation of bolts, an adequate bolting pattern, and the driller realizing the responsibility of his job. Proper installation of bolts requires a machine to be in adjustment, the use

of proper bit sizes and lengths of augers, and correct bolts, shells, and washers. An adequate bolting pattern should be followed consistently, and bolts installed as quickly as roof is uncovered.

Following are case histories of what is being done at three mines in the Eastern United States.

## REPORT ON MINE A

The mine is operated in the Pittsburgh No. 8 seam of coal which averages 6 ft 5 in. in thickness. The bottom is a soft fireclay. The top above the seam varies considerably throughout the mine, but generally the immediate tops above the coal seam is typical drawslate a foot in thickness. For about 10 ft above the drawslate various roof structures exist. Usually a rooster coal is located above the drawslate about a foot in thickness followed by successive thin layers of shales and coal. In other places the strata above the drawslate is made up of a non-stratified shale with many slips and slickensides. Or the strata may be composed of successive thin layers of shale and sandstone for about three ft up to a massive sandstone which is ideal for roof bolting. In a small portion of the mine a massive sandstone immediately overlays the coal seam. Where this occurs the seam is usually rolling and faulty. In places it has been found impractical to roof bolt because of the heavy nature of the roof. In these areas five-in. steel H-beams are used for support.

A block system of mining is used with rooms on 115-ft centers and cross-cuts on 70-ft centers. Development places are driven a maximum of 16 ft wide. Blocks are extracted by driving splits 16 ft wide and extracting an eight-ft fender providing an over-all recovery of 85 percent. Until the introduction of roof bolting in certain sections of the mine as a sole means of roof support the drawslate was mined with the coal and removed in the cleaning plant.

### Bolting Drawslate

Since the advent of roof bolting in this mine it has been possible to support the drawslate on bolted sections by leaving a five-in. layer of coal just below the drawslate. This has provided a better top, a better raw coal product and has improved the quality of the cleaned coal by eliminating the high sulphur coal existing in that portion of the seam. Consequently this practice is followed in all working places with the exception of the haulage entries where the additional height is needed.

Roof bolts are installed on four-ft centers with three bolts across the entry. Under certain conditions four

bolts have been installed across the entry on shorter centers to give greater support. In general, a five-ft bolt is used with an expansion type shell for anchorage. Where poor anchorage exists at five ft and better anchorage exists at six ft, a six-ft bolt is installed. Four six-ft bolts are installed near the corners of all intersections to provide additional strength



Spot checking installed bolts serves as a useful appraisal of the bolting method

to the bolted structure at these points. Four-ft bolts are used in sections where a four-ft hole penetrates a massive sandstone. Where head coal is held a formed steel plate six in. square is used as a bearing between the bolt head and the head coal. Where the drawslate is taken down a drilled cap piece 3 by 5 by 18 in., with a 3 by 1/4 in. steel washer, is used. Under friable roof it has been found advisable to bolt a plank 1 1/2 in. by 8 in. by 10 ft against the roof. This is also used on haulage entries at intervals of 12 ft to provide a means for anchoring trolley wire and feeder cable.

### Drilling Procedure

Rotary drills are used throughout at the present time on the producing sections. These are equipped to provide thrusts up to 5000 lb and speeds varying anywhere from zero to 400 rpm. Where the drilling is soft, high

speed and low pressure are used. Where hard sandstones occur, the speed is reduced and maximum thrust is employed. The machines are set to provide a torque of 180 ft lb. This torque is checked in each place by the driller examining a couple of bolts with a dial type torque wrench. Three different sized bits are used. Either 1 1/2 or 1 3/8-in. bits are used as starter bits, drilling all but the last foot of the hole. One and three-eighths-in. bits are used for drilling the top part of the hole, the smaller diameter hole being needed for anchoring the bolt.

To maintain a low bit cost it is necessary to provide a system of bit supply whereby each driller can be checked. The system used is to provide two boxes of bits for each driller. One is available for use while the other is in the shop where the bits are sharpened. At the beginning of each shift the driller picks up his box of

bits and takes them into the section with him. At the end of the shift he brings his box of bits out for resharpening. A record of the number of bits reground and the number of replacement bits needed is kept by the man who does the grinding. In this way the manner in which each man is treating his bits can be ascertained by checking the records.

### Training

While the operation of the drills is relatively simple, there are certain fundamentals about the machine and the bolting process that must be learned before putting a new man on a drill. To provide this training a new man is given several days with an experienced driller before he is asked to operate a drill by himself. (The drilling on each section is done by one man.) Then he is given the drill and with some coaching by the foreman he

is able to do the work and soon becomes a capable operator.

### Reduce Bit Cost with Wet Drilling

It should be noted that the bit cost became excessive when trying to drill certain sandrock formations dry using a dust collector on the drill. In fact, the operation became impractical. Casting about for some solution, it was decided to equip the drills on these sections with water tanks and pumps to force water up through a

	Labor	Supplies	Total
Section .....	\$0.21	\$0.29	\$0.50
Repair and maintenance.....	0.02	0.03	0.05
Total .....	\$0.23	\$0.32	\$0.55

hollow hex steel drill section to the bit. This practice proved successful and as a consequence additional drills have been put in service for wet drilling. The benefits from this change have been twofold; it made rotary drilling of sandrock feasible, and it eliminated the need of a dust collector.

During the last year 100,000 roof bolts have been installed at this mine and the above tabulation shows the bolting cost per ton.

The above tabulation also includes the bit cost which is \$0.03 per ton material and \$0.003 per ton for grinding and handling.

## REPORT ON MINE B

This is a southwestern Virginia coal mine operating in the Imboden seam. Coal averages 78 in. thick. Twenty-five percent of the roof drilling is done in massive sandstone, the remainder in shale and sandstone laminations.

Roof bolting has increased productivity 30 percent and the mine reports a better safety record with roof bolting than with timbering. Primary reason for the increased safety is that the risk of knocking timbers out with shuttle cars and therefore causing roof falls has been eliminated. Mine officials report, however, that they get

falls between roof bolts the same as they did between timbers.

At the present time, 5/8-in. bolts made of 1040 steel are being used. Bolts are 30 to 66 in. long, depending on the distance to the sandstone, and are anchored with expansion shells.

Bit cost is high because of the type of rock that has to be drilled. The care and handling of bits is satisfactory. Bits are brought outside at the proper stage of dullness and corners are not allowed to be worn excessively. One bit was gauged after being completely worn out and it had

lost only 1/67 of an in. in gauge.

Each drill has his own string of bits. He carries them in and out each day. Dull bits are sharpened and destroyed bits replaced and a record is kept on each driller's bit cost. Only one size bit, 1 1/2 in., is used at the mine. Coal height permits an operator to put a hole up with one auger.

All drill men are carefully trained as helpers before being put on as operators and are carefully selected for the job.

The maintenance program calls for a regular program of drill inspection and lubrication and any necessary repairs are to be taken care of immediately upon detection.

## REPORT ON MINE C

Approximately 15,000 bolts are set per month at this mine which is in eastern Kentucky. This represents an expenditure for materials and labor of well over \$15,000 per month and it was thought advisable to set up an education and control program with an engineer in charge. The program was established as being a part-time job for the engineer, and is specifically his responsibility. He spends one or two days a week on the bolting program and reports directly to the Mine Superintendent.

To aid in obtaining information concerning bolting practices and methods on the various sections, the engineer in charge of the bolting program designed a special report. When bad practices are encountered or when difficult conditions are found, they are noted on the report for correction, usually through the foreman on the section. Frequently, the engineer works directly with the bolt crew to iron out problems. These are usually technical problems rather than bad practices.

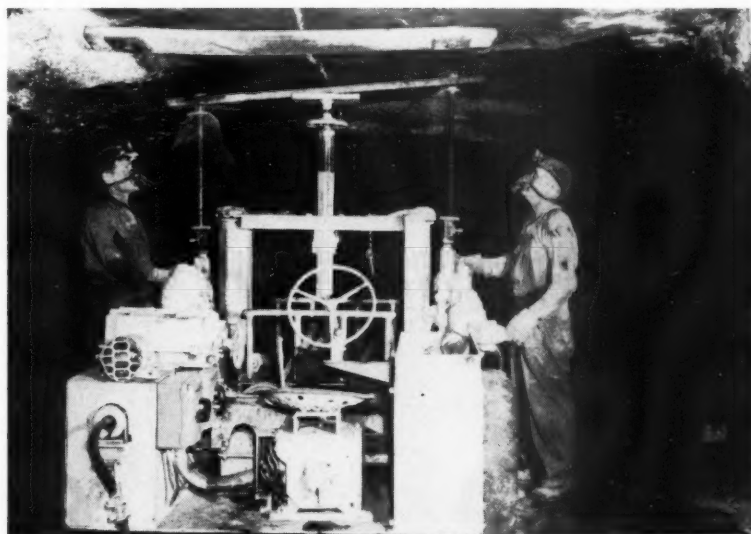
### Bolting Practice

At present the company uses mostly 3/4-in. diameter bolts but is experimenting with 5/8-in. bolts. The most common bolt lengths used are 28, 36, 42 and 48 in. although once in a while

conditions warrant the use of 16 or 18-in. bolts. Expansion shells are used for anchorage. Starting bits are usually 1 1/2 or 1 3/4-in. and the finishing bits are usually 1 3/8 or 1 1/2-in. Twelve rotary type roof drills and one stopper are used for drilling roof bolt holes.

A straight drill stem is used except where interbedded layers of hard and

soft rock are encountered. In passing from soft to hard rock, the bits have a tendency to offset as they advance. This frequently results in having the expansion shell bail rupture by being caught on the offset as the bolt is being run up. By using spiral stems with flights about the same size as the hole diameter, the offset is reduced to the point that the bails do not catch and break. The spiral stem,



It is common practice to train men as helpers before making them operators

however, does not work effectively with the gravity type dust collector being used at the mine.

Two or three stem changes are generally all that is required in drilling a hole. When the bolt length is about equal to the seam height, it is sometimes necessary to use a stem extension with the rotary drills since about four in. of drilling height is lost when using the dust collector.

### Bit Care Important

Bit condition is considered a critical item and is closely watched by the roof bolt engineer. Drilling with dull bits results in overheating and damage to the bit and puts excessive strain on the bolting machine with damage to clutch, gears and motor. Special adapters are used on some of the rotary machines to reduce the drilling speed when sandstone is encountered.

Each shift has two strings for bits, one for sharp and one for dull bits. At the beginning of a shift, the sharp bit string normally has from six to 12 bits. As these become dull, they are placed on the dull bit string and taken out to the mine shop to be sharpened.

Bit sharpening is performed by specially trained men in the shop. This operation is also considered a critical item since the way a bit is sharpened has a bearing on how well it cuts and how long it will last. In the mine, a hole gage is used to check the diameter of the hole at the back. The company has found that if a bit is ground off center the hole will be enlarged, making proper anchorage impossible in some materials.

### Bolt Anchorage and Applied Torque

Roof bolt anchorage is closely observed by the engineer. Frequently better material for anchorage can be reached by using longer or shorter bolts since the portion of the rock strata offering the best anchorage often varies with respect to the coal seam. Training of drill operators to notice these changes in the rock strata and to use the proper length bolt is part of the engineer's task.

Strength of the anchorage material encountered throughout the operation varies greatly. As a consequence the tension applied to roof bolts for best results varies from one section to another. Determining the correct torque for the various anchor materials and training the operators to produce the desired torque are also part of the engineer's job. The company has experimented with setting drill clutches for desired torque but found that when the proper torque was set for tightening the bolt, the setting was too low for drilling. At the present time, a trial and error method of



A minimum bolting pattern should be established and followed conscientiously

tightening bolts is used but the final results have been very good. After the applied torque has been determined the bolts are set and then checked with a torque wrench. This procedure is repeated until the drill operator can judge from the feel and sound of his machine that the correct torque has been reached. Normally, torque runs between 150 and 200 ft lb.

### Things the Engineer Looks For

Bolting and timbering plans are established for the various mining plans used in the mine. After a bolting plan is chosen for a given section, adherence to the plan is watched closely. Normally a straight 4 by 4-ft bolting plan is used. However, some experiment is being done with two and three bolts in alternating rows but still maintaining the four-ft spacing.

Bleed-off torque is checked with a torque wrench on bolts previously set. This gives an indication as to the holding ability of the anchor material.

Some bolts are recovered and used again. However, there is not an extensive bolt recovery program since most of the mining is on a total extraction basis.

The engineer, on his inspections, checks such things as plates set on an

angle, cap coal bolted to the top and excessive burring of bolt heads on the plates. These are things to be corrected. The engineer also points out changes or improvements he feels worth while and notes special tools or supplies that might be needed to meet unusual conditions or special requirements. Reports by the engineer are turned into the Mine Superintendent with copies of them to the General Mine Foreman.

The roof bolt engineer also furthers super advisory training by furnishing literature concerning roof bolting to all foremen. This he secures from whatever sources are available, such as trade journals and equipment manufacturers.

### Results of Program

The company feels that its education and control program, with an engineer in charge, is meeting the training needs of its personnel in that bolting practices have been greatly improved since the program was started. The program will continue in much the same manner as described above, with the expectation that as training improves the bolting work being done, the engineer will have to spend less time in checking results and training personnel.





# The Silver Mining Industry In Mexico

- A Study of Silver From the Mexican Viewpoint Reveals Some Colorful History.
- Our Southern Neighbor Has Been the Foremost Silver Producer Since Early Colonial Times.
- Some Figures Are Quoted Showing the Importance of the Silver Industry to the Economy of the Western Hemisphere.
- World Silver Production Now Lags Behind World Consumption Making Wise Pricing Policies Imperative.

IN EFFECT, since the colonial period and later, during its independence, Mexico has held first place as a producer of silver in the world. The tradition of Mexico as a mining country is due precisely to its production of silver and the Mexican Republic is intimately associated with this metal in the annals of mining. Our territory is prodigious in deposits where, in one form or another, the white metal is found. If a mining map of the Mexican Republic be examined, it will be seen that of the 32 entities of which the federation is composed, only the States of Colima, Campeche and Yucatan, and the territories of Quintana Roo and the Federal District, have no silver deposits; and even in these entities it is possible that such deposits exist, since their areas have been explored very little.

Our silver ores are not generally of very high grade. It is estimated that the average general content of ores extracted in silver or silver and gold mines is about 260 grams of silver per ton. Some of the famous silver districts of the past such as Guanajuato, Zacatecas, Batopilas, Tlalpujahua and Real del Monte y Pachuca, have gone down considerably in recent years, even though many of them still have great possibilities and are far from being exhausted.

Our production now is obtained from activities which continue to be carried on in traditional silver mines and from silver which is obtained as a by-product from mines operating fundamentally for other metals, especially lead and zinc. Nevertheless, geologists who have studied our territory affirm that there are still untouched reserves of silver deposits which, under favorable conditions, might be located and exploited in the future.

## Early History

Silver is intimately linked with the growth and consolidation of Mexico as a political-historic entity, with the economic development, the culture and the very existence of our country. It caused the population and colonization of our territory. The desire to possess it drove the conquerors to explore the



By GUSTAVO P. SERRANO

President  
The Mining Chamber of Mexico

most distant regions of the country and, when a silver mine was discovered a "Real de Minas" (or royal mining camp) was created around it. This soon became a city which served as a center of support to other populations and from which radiated, fan-like, new expeditions to other places where the process was again repeated. It was because of silver that in the sixteenth century the colonization of the northern part of our territory took place in a cruel struggle against nature and Indians, which has been described masterfully by Philip Wayne Powell in his book, "Soldiers, Indians and Silver." In the same century a



The city of Guanajuato is the center of one of Mexico's famous old silver mining districts



chain of towns was forged which extended from Mexico City to Parral, passing through Guanajuato and Zacatecas, and mining activities were started in the districts of Parral and Santa Barbara. It was necessary to transport with mules all the equipment and supplies necessary for the operations of the mines and the living of the inhabitants. This was a feat which can be compared to the settling of the Far West, except that it was done with the elements available 300 years earlier.

Silver permitted an active commerce between Mexico and the old world which in turn made possible a flourishing cultural life in our country, during which the first university in America was founded and the printing press was established—before the end of the sixteenth century. The mining of silver has been the promoter of works of art, such as the churches of Santa Prisca in Taxco and San Cayetano at La Valenciana. It has been the creator

of many of the psychological traits which form the Mexican character and of the legends of great miners still remembered in our history. One such was Cristobal de Oñate, conqueror and miner, who each day rang a bell so that all of the poor of the town might come and eat at his table. Another was Jose de la Borda, who became exceedingly wealthy in Taxco and, after having constructed and decorated the church of Santa Prisca at his own expense, became completely bankrupt only to begin again in Zacatecas and amass another extraordinary fortune.

Silver thus exercised a decisive influence in the life of Mexico during the colonial period, continued performing a preponderant part in independent Mexico all through the nineteenth century, and continues in our day to be a factor of considerable importance in the economy of our country.

The exploitation of Mexico's silver mines in a systematic manner began

in the year 1521, the year the Conquest ended. From then until 1891 Mexican mining was confined almost exclusively to the extraction of gold and silver. The eagerness of the conquerors to enrich themselves rapidly and the mercantile theories that prevailed during that time, as well as the policy of the Spanish Court, caused the activity of our miners to be directed in a primordial manner to the extraction of the precious metals, neglecting the utilization of the industrial metals. The low prices of the latter metals, costs of transportation and the lack of domestic industries in which they might have been consumed, caused their extraction to be unattractive and unprofitable for Mexican miners. Silver, on the other hand, has always greatly surpassed our production of gold.

### Mexico Is Foremost Silver Producer

Among the mines exploited in those times were some of great richness; however, in general it has not been so much the high grade as the extent and volume of the deposits which has given these mines their great potentiality. Discoveries followed with surprising rapidity and by the end of the sixteenth century our silver mining was firmly consolidated. Mexico soon occupied first place as a producer of silver in the world, reaching 63.98 percent of the world production in the years 1781 to 1800. From 1720 to 1850, Mexican production always exceeded half or the production of the whole world.

The silver produced in the world from the year 1521 to 1900 amounted to 8,889,609,328 oz and in the same period Mexico produced 3,299,318,358 oz, representing 37.11 percent.

During this period, the mining of silver was the most important of our industries and the principal component of our foreign commerce. It is not easy to obtain precise statistical data but, to back my assertions with some figure, I refer to the data given by Brantz Mayer, the lawyer who was secretary of the American Legation in our country in the year 1842 and who, in his book, "Mexico, What It Was and What It Is," tells us that the exports of the Republic that year amounted to 20,000,000 pesos, of which 18,500,000 pesos corresponded to the exports of precious metals. The Mexican peso at that time was on a par with the dollar, so that those 18,500,000 pesos were equivalent to \$18,500,000. The precious metals represented 92.5 percent of our exports, according to the figures of Brantz Mayer.

Mexican silver furnished the whole world with the means of payment to meet the needs of expanded commerce and industry in modern times. This silver was utilized not only in European and American countries but also



The Church of Santa Prisca is concerned with the legend of Jose de la Borda who made a fortune mining silver in Taxco, built the church at his own expense, went bankrupt, and later made another fortune mining in Zacatecas



Santiago shaft at AVALOS, Zacatecas, Mexico

on the Asiatic continent where Mexican pesos circulated until after the nineteenth century. This almost insatiable demand for silver could not have been satisfied without the production of Mexican mines.

Silver during that period was utilized almost exclusively for artistic and monetary purposes. It was justly called "the poor man's gold" because it was the metal within the reach of people of small means upon which to found their savings.

### The Modern Period

At the end of the nineteenth century was started what might be called the modern period of our mining, and exploitation of industrial metals on a large scale began. To appreciate what that transformation signifies, it is sufficient to mention that in the 369 years from 1521 to 1890 Mexico produced 331,000 tons of lead, 88,000 tons of copper, 1,102,000 tons of coal, and 3300 tons of mercury. From 1891 to 1952, on the other hand, it produced 2,800,000 tons of copper, 9,500,000 tons of lead, and 60,000,000 tons of coal. The exploitation of zinc was begun in 1893 and from that year to 1952 5,000,000 tons have been produced.

In 1954, Mexico produced, in round numbers, 240,000 tons of lead, 248,000 tons of zinc, 60,600 tons of copper, 225,500 tons of iron, 2700 tons of arsenic, 92,000 tons of manganese, 24,000 tons of graphite, and appreciable amounts of cadmium, bismuth, mercury, molybdenum, selenium, tungsten, sulphur, etc.

This evolution has changed the structure of our mining in which the precious metals have lost in relative importance, to the degree that silver now represents about 15 percent of the total value of our mining production and gold about six percent.

### Present Silver Production

In spite of this, Mexico continues to be the first producer of silver in the world, with a production of 50,000,000

oz in 1952, 48,000,000 in 1953, and 40,000,000 in 1954. In order of importance it is followed by the United States, Canada and Peru. The production of Mexican silver in recent years has shown a tendency to decline and the volume produced in 1954 was the lowest since the year 1947. Nevertheless, preliminary data gathered by statisticians shows a recuperation and indicates a production of about 26,000,000 oz during the first half of 1955 which undoubtedly should be attributed to higher silver prices.

With regard to its origin, our silver production comes only 26.8 percent from typically gold and silver ores, and the rest is obtained from lead, zinc and copper ores. Lead and zinc ores provide 62.3 percent of Mexico's production of the white metal.

The volume of silver produced by the different States of the Republic also reflects this phenomenon. In recent years the State of Chihuahua which has held and continues to hold

first place as a producer of silver also has the greatest production of lead and zinc, and the State of Hidalgo and Guanajuato, in which fundamentally silver mines are operating, take second and sixth places, respectively.

### Economic Importance

Notwithstanding the changes that have taken place in the structure of our mining, silver, considered by itself and by the influence it exercises in the exploitation of other metals, continues to be an important factor in the economy.

It is well known that, although silver is obtained as a secondary product in mines worked fundamentally for lead, zinc or other metals, in many cases it is the determining factor in making an operation profitable and permitting the production of these other metals. An examination of the ores from which Mexican silver comes indicates that this situation is found frequently in our country and shows the indirect importance that silver holds in our mining production.

During the year 1954, taxes on the production and exportation of silver represented 24.4 percent of the total collected from mining for these items and three percent of the effective revenues of the Federal Government.

The workmen employed in mines and plants exclusively or preponderantly of silver, come to about 10,000; but if to them be added those working in mines and plants treating lead and zinc, the total would be about 40,000 workers.

In our foreign commerce, silver has amounted to about 6.10 percent of the value of our exports during the last ten years. Silver, gold, lead and zinc, together, have amounted to 28.79 percent during the same period. These figures in themselves give an idea of



Hoist and stripped horse whim, Tiro Garcia, Veta Grande, Zacatecas, Mexico. A secure future might enable Mexico to modernize many of her operations



Surface openings of the LaFe gold-silver-copper mine in jungle country south of Teapa, Chiapas, Mexico

the importance that silver and the metals extracted with it hold in our international commerce.

A small part of the silver produced in Mexico is consumed in the country. It is calculated that about five percent is used for industrial purposes, especially in the silver industry, and the remainder is destined to coinage and export.

In the last five years it is calculated that about 30,700,000 oz of silver have been coined for Mexican monetary uses. In the year 1954 the coinage was insignificant and up to the month of August 1955 there was no coinage of silver for use in Mexico. This suspension was probably due to the devaluation which took place in April 1954. But in the month of September 1955 the monetary law was amended and since then the coinage of ten and five peso pieces has been renewed, with a fineness of 0.900 and 0.720 silver, respectively, and the old coins which had been in circulation previously were retired.

Our exports of silver have been made principally to the United States, although important sales during the last five years have been made also to Saudi Arabia, Western Germany, Canada, France and, to a lesser degree, to Guatemala and Switzerland. The exports from Mexico to the United States, in the years 1953 and 1954, were 26 and 30 million oz, respectively.

### Mexico's Silver Policy

The Bank of Mexico has been acquiring important amounts of silver from Mexican producing companies and acting as a regulator in the silver market. The circumstance that Mexico is the principal producer of the white metal and that its production in

the last five years has amounted to about 23 percent of world production has permitted it to exercise a certain influence on the market. The silver policy of the Bank of Mexico has been directed fundamentally toward the stabilization of the price at levels healthy for the mining industry, and the aptness of that policy and the benefits that have been rendered to silver producers are recognized both within and outside Mexico. Mexican miners have made this recognition public on various occasions and it is appropriate to take this opportunity to repeat it again.

For a number of years there has been increasing consumption of silver for industrial uses and new applications have been found such as the manufacture of supersensitive photographic films, bearings for airplane motors, amalgams for solder, chemical and pharmaceutical products, treatment for eliminating salt from sea water, and in radar and in atomic experiments. In addition, silver has continued to be used in the arts and for monetary purposes.

The new industrial applications have modified the old structure of silver consumption in which monetary uses prevailed over those of art and industry. Now, the amount of silver used in the arts and industry greatly exceeds that utilized in coining money. During the last five years the silver used in industry and the arts amounted to 773,500,000 oz while the silver used in coining amounted to a total of 391,000,000 oz.

The world production of silver has shown a decrease since 1939 which, together with an expansion in consumption, has caused demand to exceed world production notably. This deficit amounted to a total of 126,600,000 oz during the period from 1950 to 1954, inclusive. Mexican production continues, as in the past, in an impor-

tant way helping to satisfy world demands and easing the deficit which arises year after year.

### Final Consideration

Considering the present situation of the white metal and the relation which exists between the volumes of production and consumption, it is by all means desirable to strengthen and stimulate the production of silver so that it may respond to the demands of our times. It is also important to take into account that the four principal producers of silver are all countries located on the American continent, and two of them are neighbors of the United States.

There should also be kept in mind not only the importance that silver has in itself, but that which it has as a determining or auxiliary factor in the development of other precious and industrial metals which the world needs and of which the silver producing countries are large producers.

An unfavorable alteration in the silver market would result in reduced production of this metal and would also affect lead and zinc, injuring the internal economy and the foreign commerce of the producing countries. In Mexico, and I understand also in Canada and Peru, foreign commerce depends greatly upon the exportation of those metals. Thus the damage suffered by silver would echo not only in the producing countries but also in those dealing with them.

The above justifies the conviction that not only Mexico but all silver producing countries and the whole world should be interested in keeping the price of the white metal at remunerative levels, so as to permit the production from our mines to continue contributing in the future, as in the past, to the progress of human civilization.



San Ignacio Mill, Ocampo, Chihuahua, Mexico



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Comparison of U. S. Fire-Resistant MineHaul Belts with standards as set forth in United States Bureau of Mines Schedule 28\*

	minutes			
	0	1	2	3
<b><u>After-Flame Test</u></b>				
U. S. B. M. Standard	flame must extinguish itself within 1 minute after burner has been removed.			
U. S. Fire-Resistant MineHaul Belts				
4-ply, 42 oz.	}	flame extinguished itself immediately after burner was removed!		
4-ply Style EN				
4-ply Style XN				
<b><u>After-Glow Test</u></b>				
	no after-glow within 3 minutes after burner has been removed.			
U. S. B. M. standard				
U. S. Fire-Resistant MineHaul Belts				
4-ply, 42 oz.	no after-glow after just 36 seconds!			
4-ply Style EN	no after-glow after just 24 seconds!			
4-ply Style XN	no after-glow at all!			

\*as tested in United States Rubber Company laboratories in accordance with Bureau of Mines test specifications.

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These belts are the result of an extensive development program carried on by U. S. Rubber to provide the mine operator with underground conveyor belts that offer *maximum* fire resistance. In fact, the new U. S. *Fire-Resistant* MineHaul Belts EXCEED the Bureau of Mines specifications, as the chart above shows.

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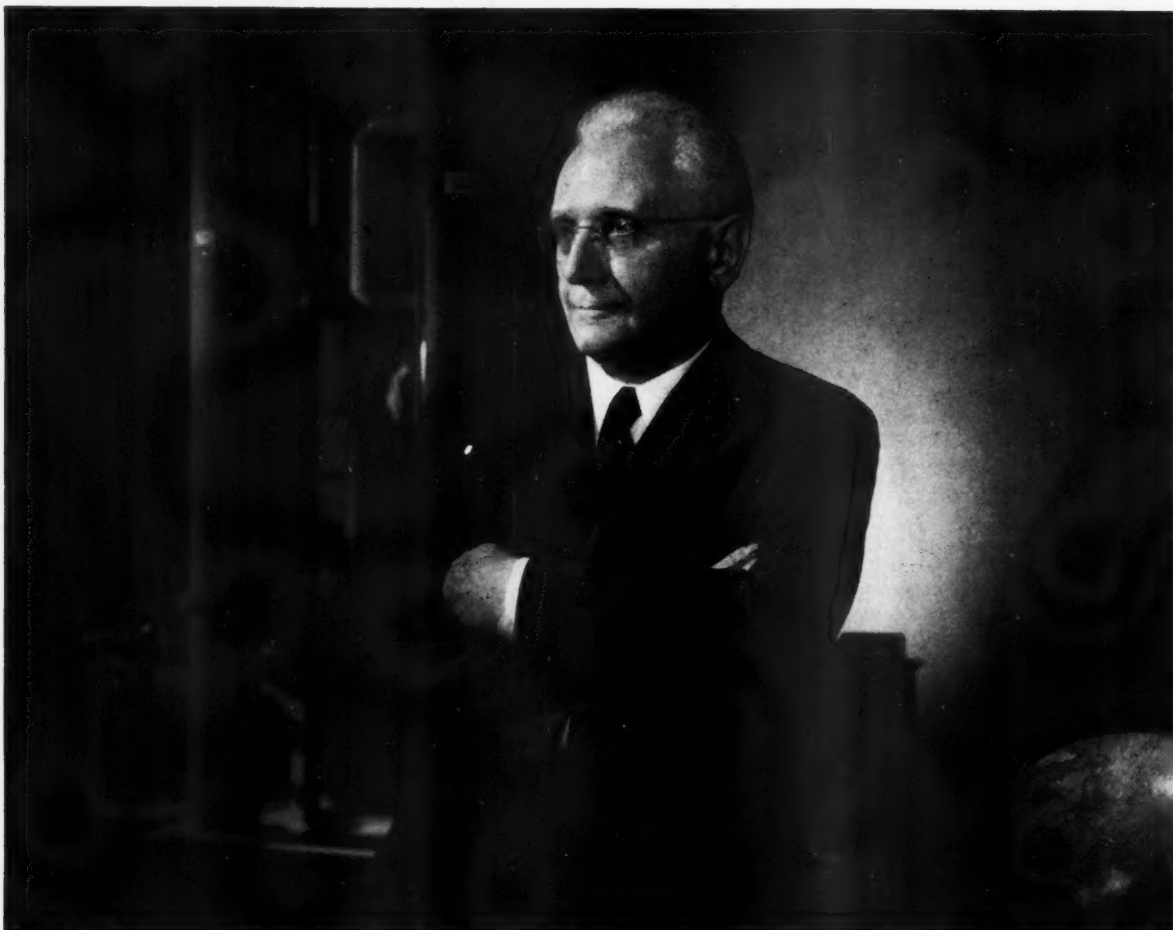
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Mechanical Goods Division

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# MINING CONGRESS JOURNAL



# Tire Breaker

AT THE Anaconda Co. property at Weed Heights, Nev., Bill Cross, in charge of all automotive and mobile equipment repair and maintenance, has developed a unique device which he calls the "Tire Breaker." This device is used for demounting and mounting the 18:00 x 25, 28-ply tires used on the large Dart haulage trucks.

Figure 1 displays the apparatus which consists of four arms anchored to the base of the breaker. These arms are held by pins in order that they may be brought together at a central point to permit the placing of the tire or the removing of the tire. The tire breaker works by using a 100-ton hydraulic jack which is placed on the square base plate and pushes against the circular plate. This plate

in turn contacts the rim base of the tire. The hydraulic action against the plate is actuated by the small high pressure hydraulic pump shown at the lower righthand corner of figure 2. This hydraulic pump has a capacity of 10,000 psi.

Figure 2 shows the wheel in place on the tire breaker with the arms placed and contacting the upper side flange of the rim. As the tire and rim are forced upward by the hydraulic pressure pushing against the plate, the tire breaker arms force the flange down and off the tapered bead seat band.

The third illustration shows the tire and rim after they have been broken apart.

The last figure completes the cycle

and shows two small jacks mounted on the upper part of the press and connected to the "Ring Pusher." By the hydraulic action of these two small jacks the bead seat band is pressed down and off the lock ring so that it can be removed.

In mounting the tire on the rim the reverse procedure can be followed.

Use of the "Breaker" allows an 18:00 x 25 tire to be mounted or demounted by one man in about 15 minutes and is especially useful in mounting stiff new tires.

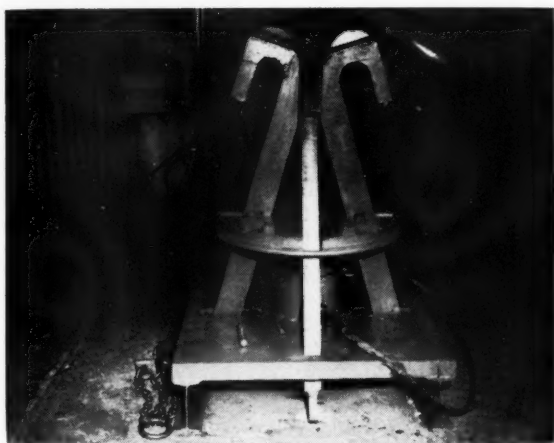


Figure 1



Figure 2



Figure 3



Figure 4





# Wheels of GOVERNMENT



As Viewed by HARRY L. MOFFETT of the American Mining Congress

CONGRESS has returned from its Easter vacation and is stepping up its tempo in an effort to dispose of a large number of pending major legislative proposals in time to adjourn by the end of July or mid-August.

Aside from such measures as the highway program, liberalization of the social security law, authorization for the Organization for Trade Cooperation, technical tax revision, a new farm program and a host of minor bills, the Congress still has to act on a large number of funds measures for Government Departments and agencies. The Presidential veto of the patch-work farm bill, which failed to be overridden by the House, may complicate the adjournment picture. The President has requested that his soil bank program be enacted and currently his legislative lieutenants are driving hard to get consideration of this proposal.

The veto of the farm measure also affected the mining industry. The bill sent to the White House contained a provision which would have required that all strategic materials received in barter or exchange for surplus agricultural products be "locked up" in a supplemental stockpile created under the Agricultural Trade Development and Assistance Act and not be subject to disposal on the open market. Since increasing quantities of minerals and metals are being received under the barter program it is becoming highly important that steps be taken to prevent the possibility of their being dumped on the domestic market with accompanying harm to domestic mining industries. The American Mining Congress has been consulting with Administration officials and members of Congress in an effort to obtain support for passage of a separate measure to accomplish the objective of the provision contained in the farm bill.

Meanwhile, it is becoming more and more clear that little legislation is likely to be enacted which will strengthen the domestic mining industry. While there are a number of bills in the legislative hopper that would aid domestic mining, observers

feel that most of them will not be approved at this session.

## OTC Up for Floor Debate

The controversial measure to authorize United States participation in the Organization for Trade Cooperation (OTC), which will administer the General Agreement on Tariff and Trade (GATT), is now before the House for consideration. Bitter opposition to OTC is expected to be voiced by a number of leading House members, who are of the opinion that its approval is tantamount to ratifying GATT and to making the U. S. subservient to an international organization in the determination of trade policies.

Heavy Administration pressure for the passage of the bill is expected to result in its approval in the House.

The strong opposition of many industry organizations, including the American Mining Congress, voiced before the House Ways and Means Committee, resulted in that Committee amending the bill to make it clear that (1) nothing in the measure shall be construed to enlarge or alter the authority granted the President under the Trade Agreements Acts or to repeal or modify any existing legislation of the United States, and (2) the acceptance of membership for the United States in OTC in no way commits this country to enact any specific legislation regarding any matter referred to in either the OTC agreement or GATT. The Committee also amended the measure to require the chief U. S. representative to OTC to be appointed by the President with Senate consent, and to authorize the President to appoint such additional representatives as he deems necessary.

The Committee wrote into the bill two other important amendments. The first emphasizes that it is the understanding of Congress that the functions of OTC will be limited strictly to the administration of GATT in the field of trade and that it will not be an intergovernmental body having wide international responsibilities in the economic field;

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## Washington Highlights

**OTC:** Before House.

**HIGHWAY PROGRAM:** Gets green light.

**SOCIAL SECURITY BILL:** To stir controversy.

**COAL RESEARCH:** Subject of study.

**IMPORTS:** New procedure established.

**FREIGHT RATES:** Another boost?

**MINERAL PROGRAMS:** Hearings open.

**TAX CUT:** Outlook dim.

★ ★ ★ ★ ★ ★ ★

the second would bar the President or any other person or agency from accepting any amendment to OTC unless so authorized by Congress.

A majority of the Committee defended U. S. participation in OTC, stating that there are no valid legal or constitutional objections to such participation. On the other hand, six members wrote a blistering minority report opposing the measure. They declared that enactment of the measure will be interpreted as Congressional endorsement of GATT and as sanctioning further reduction of U. S. tariffs. They also said authorization of OTC membership by Congress will result in an almost complete transfer by the Congress of its constitutional authority over U. S. foreign commerce policy to an international organization. They pointed out that the U. S. would have only one vote in OTC and would have to be bound by the majority decisions of the 35 member nations even though this country has the largest single volume of world trade.

## Highway Program Voted

The House Public Works Committee has sent to the House a bill authorizing construction of a 40,000-mile interstate highway system to cost \$51.5 billion over the next 13 years, and

hiking taxes on vehicles, tires, and fuels to partly defray the cost of the road net. The measure will be up for debate during the latter part of April and is expected to be sent to the President at an early date.

In approving the bill, the Public Works Committee incorporated into its construction authorization measure the provisions of the highway tax bill approved by the House Ways and Means Committee earlier.

Under the measure, the Federal Government would contribute \$24.8 billion to the interstate system and another \$2.2 billion for other road construction. Amendments were written into the bill authorizing the Federal Government to reimburse the States for part of the costs involved in relocating utility facilities, and making the Bacon-Davis Act apply to initial construction work. This latter amendment will come under sharp attack on the floor of the House for it requires the payment of prevailing wages to workers on the construction projects, thus expanding the coverage of the Bacon-Davis Act to areas not heretofore covered.

### Social Security Amendments

The Senate Finance Committee is currently considering the House-approved measure to amend the Social Security Act by lowering the retirement age for women to 62, increasing disability benefits, and extending coverage to professional men and women. The House bill would also require an immediate increase in the present 2 percent Social Security tax on employers and employees to 2½ percent each, with additional ½ percent increases to become due in 1960, 1965, 1970 and 1975.

A number of influential members of the Senate Finance Committee and of the Senate are opposed to the heavier taxes and to the lowering of the retirement age for women. The Administration also has expressed the view that the proposed changes will open the door to demands for other revisions including the lowering of the retirement age for male workers. For these reasons it is expected that the bill will face rough sledding in the Senate.

### Coal Research Inquiry

In mid-April the House passed a resolution, sponsored by Rep. Saylor (Rep., Pa.), which directs the House Interior and Insular Affairs Committee to conduct a study on the possibilities of a research and development program for the domestic coal industry. A special subcommittee will probably be appointed to conduct the inquiry.

In championing his measure during House consideration, Saylor said it is highly important that the domestic coal industry be maintained in a vigorous condition. He said the study

should include consideration not only of the production, transportation and distribution phases but also coal utilization. He told the House that after the study is concluded he expected the Committee to make recommendations to carry out its findings.

### Import Relief Procedure Established

The Office of Defense Mobilization has established a new procedure to be followed in handling formal requests from industry for relief from excessive imports under the national security provisions of the Trade Agreements Act.

Hereafter, ODM will hold public hearings on petitions for import relief. The hearings will be conducted by an ODM examiner or staff member and the findings made by them will form the basis of recommendations which ODM Director Flemming may submit to the President. If he so desires, the President may then order a full-scale investigation before acting on the petition.

This procedure will be used in several pending cases, in which industries have asked for protection against imports of jeweled watches, cordage and twine, wool textiles, fluorspar, photographic shutters, clinical thermometers and analytical balances.

ODM said the petition of the fluorspar industry will be the first to get a public hearing. In March the President rejected the fluorspar industry's request under the escape clause of the Trade Agreements Act for higher tariffs on acid-grade fluorspar. The petition now before ODM is based on the national security provisions of that Act.

Meanwhile, the Cabinet Fuels Policy Committee is re-evaluating the status of oil imports and is expected to release its findings and recommendations shortly. The re-evaluation covers the period ending March 31, and is the first undertaken since the Committee directed a 7 percent cutback in crude oil imports from sources other than Venezuela and Canada. Whether the Committee will make any recommendations as to residual oil imports remains a question.

### Another Freight Rate Hike?

Railroad officials have declared that the 6 percent freight rate boost given them by the Interstate Commerce Commission in March is insufficient to offset cost increases since last September. These pronouncements may be the forerunner of another petition to the ICC seeking increased revenue through higher freight rates.

Officials of the carriers are currently meeting to discuss revenue problems and many observers predict that they will file a further petition with the ICC shortly.

Now pending before the Commission is a plea for higher passenger fares.

### Mineral Purchase Programs

A subcommittee of the Senate Interior and Insular Affairs Committee is now holding hearings on a series of bills which would continue the minerals purchase programs for tungsten, manganese, chromite, mica, asbestos, beryl, columbium-tantalum, and mercury. One of the measures before the Committee is an omnibus bill which, in the words of Committee Chairman Murray (Dem., Mont.) would provide continuing subsidies to these industries.

The Office of Defense Mobilization has submitted reports on the bills dealing with the continuation of the buying programs for mercury, beryl, columbium-tantalum and asbestos, in which it said that from a standpoint of national defense there was no need of the legislation. ODM stated that it already has the authority under the Defense Production Act to conduct buying programs for minerals when they are needed for defense purposes.

Witnesses from the mercury, beryl, mica, tungsten, chrome, manganese and asbestos industries testified before the Committee. In general, all of them urged the approval of measures to continue the buying programs. Little enthusiasm was voiced for the omnibus measure. The industry spokesmen said that the programs are needed if the strategic industries are to maintain a mobilization base in this country. Spokesmen for the domestic tungsten industry said that the program should be continued for a few years in order to allow the industry time to develop new uses for the metal and to broaden its markets. Representatives of the domestic antimony industry advocated that a buying program be initiated for that metal in order that domestic producers will not be forced to close down permanently.

Most of the industry witnesses voiced the opinion that if adequate tariff protection were afforded them the buying programs would be unnecessary.

Government officials will testify before the end of April. Whether or not the bills receive favorable action will depend in large part on the position taken by the Interior Department. As of this writing, no reports have been submitted by that department.

### Tax Cut Ruled Out

A rash of recommendations for reduction in individual income tax rates has broken out on Capitol Hill following issuance of a report by the Joint House-Senate Economic Committee in which it was predicted that the Fed-

(Continued on page 90)



**F. O. Harris**, for the past 30 years vice-president and general manager of Cannelton Coal and Coke Co. and of Lake Superior Coal Co., Cannelton, W. Va., has been named president of both companies. He succeeds the late Sir James Dunn, who died in January. **Paul Morton**, general superintendent, was elevated to the vice-presidency.

**Oscar A. Glaeser** has been elected a member of the board of directors of the United States Smelting Refining & Mining Co. Glaeser, vice-president and general manager of western operations since 1954 for USSR&M, joined the company in 1935 as a safety engineer. In 1942 he was named industrial relations manager and in 1950 was appointed assistant to the vice-president and general manager of western operations.



The Pennsylvania Railroad recently appointed **Walter L. Lloyd** to the new position of manager of coal research and development. Lloyd, former manager of coal and ore traffic sales and rates, will have his headquarters in Philadelphia.

The New Jersey Zinc Co. has announced two recent personnel changes. **A. L. Hayes** has been appointed assistant to the vice-president who is responsible for mining and exploration. **Alfred R. Flinn** is now eastern manager of mines for the company. He will have general supervision of the company's mines east of the Mississippi River.

Hayes joined New Jersey Zinc in 1927 as an engineer in the Gilman, Colo., mine of the company. In 1947, he was made superintendent at Hanover, N. M., and in 1949 was transferred to New York as resident mining engineer. He has been assistant to the manager of mines since 1950.

Flinn has been associated with the mining activities of the company for over 40 years. He has been assistant

superintendent of the Sterling Mine, and mine superintendent of the Austinville, Va., property. For the past three years he served as resident mining engineer in New York.

**Henry F. Warden** was elected a vice-president of Pocahontas Fuel Co. at a recent meeting of the board of directors of that company in Pocahontas, Va.

Three changes in supervisory personnel at the Nevada Mines Division of Kennecott Copper Corp. have been announced.

**Rush Muse**, formerly pit foreman has been advanced to assistant pit superintendent. **Asay B. Johnson** has taken over duties as chief engineer of the power plant. He formerly was power plant general foreman. **Frank E. Ball**, construction engineer, has been named assistant construction superintendent.

**Dr. Ford K. Edwards** has resigned as director of the Department of Coal Economics of National Coal Association, a position he held the past six years. He has opened offices as a transportation consultant.

**William E. Cotter, Jr.**, is now assistant to vice-president-sales and planning, for the Oliver Iron Mining Division of United States Steel Corp. Cotter, who had been assistant purchasing agent, was succeeded by **Leonard L. Slabodnik**.

**Hagy R. Houck** has been appointed assistant superintendent of Gary No. 2 mine of United States Steel Corp. at Gary, W. Va. For the last 17 years Houck served as general mine foreman at Gary No. 6 mine.

Magma Copper Co. has announced the following appointments which became effective January 1: **J. F. Buchanan** to assistant general manager operations, Magma Copper Co. and San Manuel Copper Corp.; **F. H. Buchella** to general manager, San Manuel Copper Corp., San Manuel Operations; **C. B. Foraker** to general manager, Magma Copper Co., Superior Operations; **J. L. Draeger** to mine superintendent, Magma Copper Co., Superior Operations; **E. K. Staley** to assistant mine superintendent, San Manuel Copper Corp., San Manuel Operation.

Announcement has been made by **H. O. Zimmerman**, manager, Coal Properties, of the Inland Steel Co., Wheelwright, Ky., of the promotion of **E. Minor Pace** to general superintendent.

Pace was employed by Inland in 1946 and has held the positions of transitman, superintendent of the Price Preparation Plant, mining engineer and mine superintendent. In his present position of general superintendent, he is completely responsible for all activities connected with the production of coal.

Potash Company of America has elected **Fred O. Davis** executive vice-president. Davis will continue as treasurer of the company and will also serve as managing director of Potash Company of America, Ltd., PCA's wholly owned Canadian subsidiary. Davis was first employed by PCA in 1936 as controller.

**Mark E. Eastin, Jr.**, has been named president of West Kentucky Coal Co., Madisonville, Ky., following the resignation of **Hooper Love** as president



**Hooper Love**



**M. E. Eastin, Jr.**

and director. Eastin has been a full-time employee of the company since 1929 and was executive vice-president before being named president. Love, an employee of the company and its affiliates for his entire business career of nearly 50 years, had been president since 1940.

**Charles F. Barber** has been appointed general counsel of American Smelting and Refining Co. **R. Worth Vaughan**, executive vice-president and former general counsel, will devote full time to his broadened responsibilities of executive vice-president.

Gov. Leader of Pennsylvania has appointed **James H. Pierce**, chairman of the board of Pierce Management, Inc., Scranton, as an alternate member of the Anthracite Committee to replace **Evan Evans**, resigned.

Appointment of **Dr. Arthur A. Baker** as associate director for the U. S. Geological Survey has been announced. He has served as administrative geologist in the office of the director since 1953 and has been continuously employed by the Geological Survey since 1921.



## — Obituaries —

J. Royce recently announced the transfer of his geological office to 207-211 Christie Bldg., 120 North 4th Avenue West, Duluth 2, Minn. The office continues as The Geological Department—Pickands Mather & Co. J. T. Orsborn and D. G. Harris, geologists, were transferred with the office.

The Bunker Hill Co. has announced the promotion of E. B. Olds to assistant mine superintendent at Kellogg, Idaho. George Mast has been named foreman of the firm's Crescent mine.

Three appointments in the Exploration Division of the Grand Junction, Colo., operations office of the U. S. Atomic Energy Commission have been announced. John G. Barry is the new deputy director. Philip H. Dodd, geologist, becomes staff engineer. The new chief of the Engineering Services Branch is Merle E. Crew.

Minerva Oil Co. has announced that Gill Montgomery, general manager of its Fluorspar Division, Eldorado, Ill., since 1952, has been advanced to vice-president of the company in charge of the Fluorspar Division.

Additions to the Fluorspar Division of the mining and milling staff within recent months include Jerome J. Daly, as mining engineer and William Rule as metallurgist at Minerva's No. 1 mill, Cave-in-Rock, Ill.

The advancement of Floyd W. Erickson to manager, Babbitt Division, Reserve Mining Co., has been announced. Erickson started with Reserve in 1951 as chief mining engineer. Later he became general superintendent at Babbitt and last May was advanced to general superintendent at Silver Bay.

Walter R. Lowry, formerly treasurer and assistant secretary of the Beryllium Corp., Reading, Pa., has been named vice-president and treasurer of the company.

The retirement of J. W. Koskinen, chief ore grader for The M. A. Hanna Co. at Hibbing, Minn., has been announced. M. A. Bergan has assumed the duties of chief ore grader. Koskinen will continue with the company in a consulting capacity.

K. D. McBean, of the metallurgical staff of The Consolidated Mining and Smelting Co. of Canada Ltd., sailed March 3 for Europe where he will act as consultant metallurgist to the "Zorka" Co. at Sabac, Yugoslavia, in connection with the start-up operations of the new electrolytic zinc plant. He will return to Canada by way of Turkey, Greece and Italy, and will visit some metallurgical plants in France and Belgium, arriving in Trail about the end of June.

Harry Morgan Moses, 59, president of the Bituminous Coal Operators Association and widely known coal mining executive, died of cancer April 1 in Washington, D. C. His work in the past five years had been credited with bringing labor peace to the long-battled bituminous coal industry.

Mr. Moses was born to a coal-mining tradition. He began working in the mines while still in High School and continued while in Wabash College. After working his way up through jobs as section foreman, assistant mine manager, mine superintendent, and general superintendent for the U. S. Fuel Co.



at Georgetown, Ill., a U. S. Steel subsidiary, he went to Gary, W. Va., in 1933, as assistant general superintendent of the West Virginia and Kentucky Divisions of the U. S. Steel Co. coal mining subsidiary there. Later that year he was named general superintendent. He remained at Gary until he moved to Pittsburgh in 1938 and succeeded his father, the late Thomas Moses, as president of H. C. Frick Coal Co., another subsidiary of U. S. Steel. In 1950 he joined the newly-created Bituminous Coal Operators Association as president.

Mr. Moses had long been active in the affairs of the American Mining Congress, having served a period of years as Chairman of the Advisory Council of the AMC Coal Division, and as a National Program Committee Chairman for the annual Coal Convention.

### MARDEN W. HAYWARD

AN APPRECIATION  
BY HIS ASSOCIATES

Marden W. Hayward, 73, mining geologist par excellence, officially known as "Doc" to his legion of friends, died February 4 at his home in El Paso, Tex.

Born in Yankton, S. D., in 1882, Marden Hayward graduated from Massachusetts Institute of Technology in 1906. Commencing his career as geologist for the firm of Spurr & Cox, he joined the staff of the American Metal Co., Ltd., in 1915, and was associated with them henceforth, though since 1933 devoting only part of his time and talents to the work of that company.

Marden Hayward's contribution to geology and mining was steadily and

modestly made throughout his long and active career, which took him to most of the mining districts of North, South and Central America and Canada. His early work in Mexico, particularly on the occurrence of lead-zinc ores in dolomitic limestones, contributed measurably to the science of geology. Better known in the mining world is the important part which he played in the development of the Climax molybdenum ore deposit, Colorado, and the copper deposits at Minas de Matahambre, Cuba.

A warm-hearted and generous man, he gave fully of his wonderful knowledge and ability to his associates and to those fortunate younger men who were privileged to work with him and to learn from him. "Doc's" greatest pleasure was to bring happiness to others, whether long-standing friends or acquaintances. An outstanding man in his profession, he was truly loved by all who knew him.

Martin L. Garvey, 74, well known in the bituminous coal industry, died March 22 in Washington, D. C.

Mr. Garvey was born in Piedmont, W. Va., and joined a mining firm at



Frostburg, Md., when he was 16. Ten years later he became general superintendent of all the mining operations of Davis Coal and Coke Co. After that he served as president and general manager of several coal and coke

companies.

Mr. Garvey was elected president of the New River Operators Association in 1924. He was also director for 25 years of the Mississippi Valley Association and was an authority on the water transportation of coal.

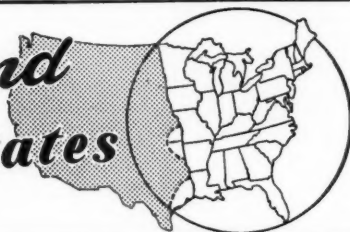
George H. Esser, president of the Virginia Coal Operators Association, died in Norton, Va., March 27. Mr. Esser spent his entire business life in the bituminous coal industry. He was born in Pennsylvania and came to Virginia in 1897. At that time Mr. Esser, Sr., was general manager of the Stonega Coke and Coal Co., and later became head of the Colonial Coal and Coke Co. at Dorchester, Va., predecessor of the present Wise Coal and Coke Co. Mr. George Esser joined his father in management at Dorchester and, later, went with the Esser Coke Co. at Esserville, Va. He was elected secretary of the Virginia Coal Operators Association in 1935 and president in 1943.

# NEWS

## and VIEWS



### Eastern and Central States



#### New Florida Cement Plant

General Portland Cement Co. has announced plans for the construction of a new plant in Southeast Florida with initial annual production of 1,250,000 bbl of cement. A contract for the purchase of a site for such a plant and quarry has been entered into and a petition is pending for the needed rezoning of the site according to the company's annual report.

The report went on to say that a program, commenced in 1955, for the installation of a new kiln and related grinding facilities at the Fort Worth, Tex., plant should be completed about mid-1956. These additional facilities will result in an increased capacity at that plant of 1,250,000 bbl per year.

#### Iron Ore Shipping Season Starts

The Lake Superior Iron Ore Association reports that the first iron ore boat of the season was loaded at the Great Northern dock at Superior, Minn., April 7, and departed that day. It was the Wilfred Sykes, flagship of the Inland Steel Co., carrying 18,043 tons of ore from the Mesabi range.

Thus, as most of the country figures it, started the 1956 ore shipping season. Iron ore miners calculate the start of the shipping season as the time that ore is loaded in the mine for lake shipments. During the winter months, iron ore miners are busy with stripping and development work. This, together with the major overhauls of ore mining equipment and benefi-

ciation plants, make iron mining a year round operation.

By 7 a. m. April 9, 53,729 tons of iron ore were on the way down the lakes. This compares with 10,103 tons at the same time in 1955. In addition, a boat was loaded on April 8, with taconite at the new dock at Silver Bay, Minn., of the Reserve Mining Co.

Unofficial estimates of lake shipments this year, barring a steel strike, are in the neighborhood of 90,000,000 tons. This compares with 87,400,000 tons last year, a peace time tonnage record, and 95,800,000 tons in 1953, the all-time record.

#### May Enter Bituminous Field

Philadelphia & Reading Corp., Philadelphia, a long-time producer of anthracite coal, revealed in its annual report that it may enter the bituminous field.

"Because the long-term future for bituminous coal appears to be favorable, we shall give serious consideration to entering the bituminous industry if an opportunity to do so on favorable terms appears," H. A. Newman, president, informed the corporation's shareholders. This would enable the corporation to take full advantage of the reservoir of skill and "know-how" existing in its coal organization, he said.

Newman also reported that indications of increased industrial uses for anthracite give hope that the sharply declining curve for anthracite will level out.

#### Osceola Progress

In the annual report of Calumet & Hecla, Inc., it is reported that the No. 13 shaft of the company's Osceola lode in the Keweenaw Peninsula of Michigan is completely unwatered and rehabilitated to working levels. Mining has started on the lower levels and a substantial rate of production is expected for the first half of 1956. The No. 6 shaft is about 70 percent unwatered and it is expected pumping will be completed and mining operations in this shaft will begin late in 1956.

#### Sintering Plant Contract

Sheffield Steel Division of Armco Steel Corp., Pittsburgh, Pa., has awarded Koppers Co., Inc., a contract to build a complete sintering plant and ore bedding system at its Houston, Tex., works. Koppers Engineering and Construction Division will design, build and place into operation a plant capable of producing approximately 1400 net tons of sinter per day. The installation is expected to be completed late this year.

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## Foote Merger Completed

Foote Mineral Co., Philadelphia, has exchanged 169,178 shares of its stock for the assets of Electro Manganese Corp., Knoxville, Tenn., an electrolytic manganese metal producer.

Foote is a long-established company which manufactures and markets over 50 different products to the metallurgical, ceramic and other trades. It mines, processes and sells many kinds of lithium products, of which it is the world's largest producer. Its lithium mines are in Kings Mountain, N. C., and its chemical plants at Sunbright, Va., and Exton, Pa.

Electro Manganese is the world's pioneer and largest producer of pure manganese metal.

## Memorial Fund Established

A \$3400 gift from E. J. Longyear, Minneapolis, Minn., has established the Edmund J. Longyear Memorial Fund through the University of Minnesota to provide scholarship and fellowship assistance to qualified graduate and undergraduate students for training in mining and metallurgical engineering, geology and other basic earth sciences. The company expects to make annual contributions to the fund.

## Turbine Test Work Progress

The Locomotive Development Committee of Bituminous Coal Research, Inc., currently developing a coal-fired locomotive, expects to complete test work on the turbine by the end of this year, with construction of the first coal-burning, gas-turbine locomotive being started next year.

Test work will be performed at the committee's headquarters at the Dunkirk, N. Y., Alco Products Locomotive Plant, and will cover improvements in the coal-handling system, combustor, and ash separator of the turbine.

## Graduate Fellowships Offered

The U. S. Bureau of Mines has established a group of graduate fellowships in metallurgy and related fields at Carnegie Institute of Technology, Pittsburgh. The fellowships will be available for the academic year beginning September 1.

Graduate students selected by a joint committee will do research under supervision at both Carnegie Tech Metals Research Laboratory and the Bureau's pilot plant facilities adjoining the campus.

Projects selected by the fellows must have significant value for both Carnegie and the Bureau and must be of a fundamental and original nature so that doctoral theses can be based on them. Theses on any phase of high-temperature metallurgy related to metal refining are currently

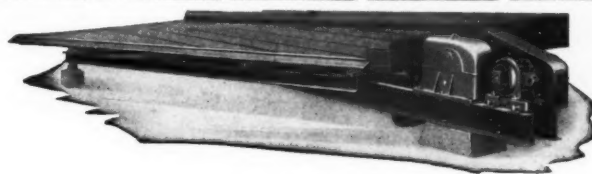
of special interest to the selection committee.

Applications for these fellowships should be submitted as soon as possible to the Dean of Graduate Studies, Carnegie Institute of Technology, Pittsburgh, Pa.

For work performed at the Bureau, fellows will receive compensation at hourly rates ranging from \$2.09 to \$3.07, depending on academic attainment and professional experience. The work will not exceed 30 hours per week.

## Boost Barnes-Dawson Output

Production at the Barnes-Dawson Coal Co. mine near Clarksburg, W. Va., will be increased 125 percent soon according to the mine's new owners. Paul Bock, president of the Galloway Land Co., recently announced his firm had purchased the mine and had already on order equipment needed to increase production. The mine, which now produces 2000 tpd, is scheduled for an output of 4500 tpd when in full production.

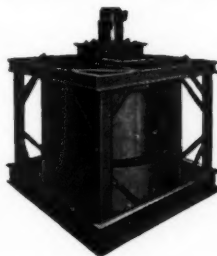


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## Safety Campaign Successful

A 29 percent reduction in deaths and injuries due to falls of ground in mines was the impressive record chalked up in 1955 by the 250 mines participating in the International Campaign for the Prevention of Falls of Ground Accidents, sponsored by the Mining Section of the National Safety Council.

The goal of the campaign was a reduction of 50 percent in the frequency rate for injuries from falls of ground. One hundred twenty-two mines surpassed that target or maintained a perfect record. For purposes of comparison, the 1955 rate was considered against the average rate for a previous period.

American mines as a group achieved an average reduction of 30 percent from their base rate. Participating mines in the eastern part of the United States showed a very marked improvement, averaging 46 percent. Substantial improvement, averaging 36 percent, was also made by mines in the southwest.

In addition, the campaign accomplished three other things. Three out of four participating mines made progress against falls of ground, although some mines did not reduce their

frequency enough to qualify for the award. An estimated 260 injuries, including about 15 permanent disabilities and fatalities, were prevented by participating companies based on what might be expected from past experience. The campaign produced a bonus for some mines. They reported that the campaign created a greater interest in safety in general with the result that there were fewer injuries from other sources.

## Mine Changes Hands

Simpson Coal & Chemical Corp., New York, has purchased 80 percent of the capital stock of Wyatt Coal Co., which operates mines in the Cabin Creek section of Kanawha County, W. Va.

## To Convert Ore Carrier

Pittsburgh Steamship Division, U. S. Steel Corp., is planning to convert the steamer Myron C. Taylor from a bulk ore carrier to a self-unloading vessel. After conversion the Taylor, now a part of the Pittsburgh fleet, would be transferred to the Bradley Transportation Line, which is operated by Michigan Limestone.

## New Sulphur Plant

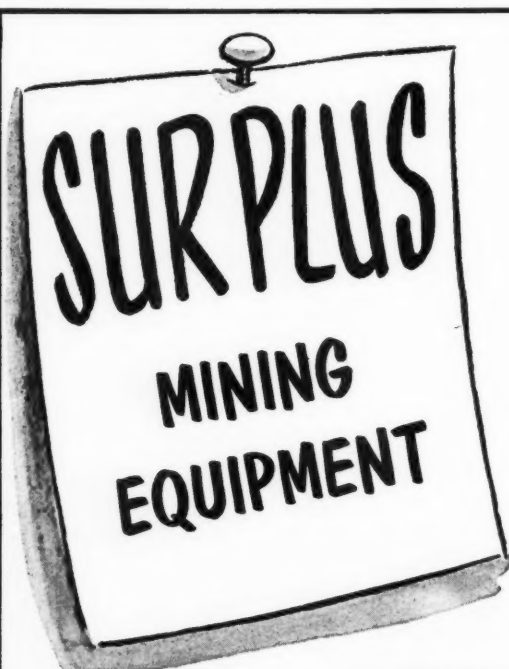
Texas Gulf Sulphur Co., Beaumont, Tex., is planning to build a plant at Fannett, Tex., to extract sulphur from the Fannett salt dome. The plant will be similar to the multi-million dollar establishment now in operation in the Spindletop oil field.

## Seek Exploration Contracts

During February the Defense Minerals Exploration Administration received 45 applications for government financial assistance on exploration projects, boosting the total number of applications received since inception of the program in 1950 to 3009. Total estimated cost of the work proposed in the 45 applications is \$2,-816,426.

The February applications proposed exploration projects for copper, fluorspar, lead, managanese, mercury, mica, tungsten, uranium and zinc in Ariz., Calif., Colo., Fla., Ga., Idaho, Ky., Minn., Mont., Nev., N. Mex., N. C., S. C., Tenn., Utah, Va., Wash., and Wyo.

DMEA executed eight exploration contracts during February to bring the total of exploration contracts to 668, of which 672 have been concluded.



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## Receive Distinguished Service Awards



Simon H. Ash



J. Bruce Clemmer



Wm. J. Fene



Geo. E. McElroy



Helena M. Meyer



Ed. M. Thomas

On Monday, March 12, the U. S. Department of the Interior honored 17 of its employees by presenting them with the Department's Distinguished Service Award.

Six members of the U. S. Bureau of Mines were among the 17 so honored. Simon H. Ash received the award for 26 years of "outstanding service devoted to safety and underground flood prevention activities in the mineral industries." An award was made to J. Bruce Clemmer in

recognition of "outstanding scientific and technical service in the Bureau of Mines," particularly in the field of mineral dressing. William J. Fene was recognized for 36 years of "outstanding service in the fields of health, safety, and conservation of natural resources." An award was made to George E. McElroy in recognition of more than 40 years of "outstanding Government service in the field of mine ventilation and related subjects." Helena M. Meyer received a citation

for recognition of her "outstanding achievements in the field of mineral statistics." Edward M. Thomas was given the Distinguished Service Award for "outstanding service and accomplishments in the field of roof control and mining."

Readers of MINING CONGRESS JOURNAL have been introduced to all of these people through their technical articles which have appeared from time to time in MCJ.

### Clymer No. 2 Mine Purchase

The Morrisdale Coal Mining Co., Philadelphia, has purchased Clymer No. 2 Mine, Indiana, Pa., from the Clearfield Bituminous Coal Corp. The mine has an extensive virgin acreage of high-grade coal.

The company is undertaking a broad program of modernization and improvements to the mine and tipple, to increase immediately the daily capacity. Under projected plans, the company expects to increase the mine output to reach in excess of 500,000 tons annually.

### That's Really Mining

A recent Reuters news dispatch from Kitwe, Northern Rhodesia, reported that the highest monthly check ever paid on the Northern Rhodesia copperbelt went to a N'Kana underground rock-breaker, whose earnings in January were £822 (\$2301). This included a bonus of £104 (\$292).

### Ore Carrier Received

National Gypsum Co. has taken delivery of the first of three ore carrier vessels built for the company in Emden, Germany. The 500-ft long *L. R. Sanderson* and two other ships slated for spring delivery will transport raw gypsum from National Gypsum's deposits at Halifax, Nova Scotia, to its processing plants at Portsmouth, N. H., New York City, Baltimore, and Savannah, Ga., as well as to two new plants now under construction at Burlington, N. J., and Westwego, La.

The *Sanderson*, which can cruise at

13 knots, has a single shaft propeller driven by twin diesel engines capable of developing 5700 hp. Constructed at

a cost of nearly \$3,000,000, the craft is equipped with radar, ship-to-shore radio and other modern equipment.

## COMMUNICATION and CONTROL



Femco systems were first in the mines and are today first in quality and dependability. Get the facts. Submit your problem for a proposal.

**SALES AND SERVICE AGENCIES**  
National Mine Service Co., Beckley, W. Va.  
Industrial Physics & Electronic Co.,  
Salt Lake City, Utah

MANUFACTURED BY  
**Femco Inc.** IRWIN, PENNSYLVANIA



### TROLLEYPHONES

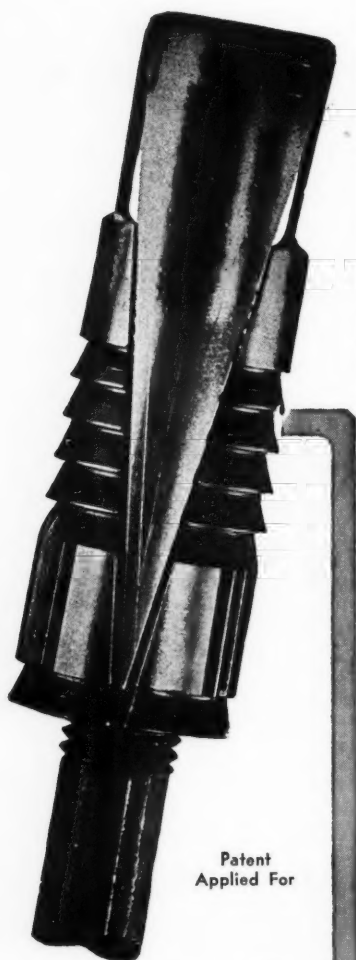
Most widely used communication for underground haulage.

### AUDIOPHONES

Finest communication between control points in cleaning plants.

### CONTROLS

Save time and money by remote control of pumps, fans, sub-stations, etc.



## Roof Bolting Offers Many Advantages—

Bolting results in less timber maintenance—improved ventilation—reduced waste handling—fewer fire hazards—wider openings—faster haulage and less material handling. Prove the benefits by making your own tests—samples of the PATTIN shells "D-1" (shown above) or the "D-2" will be furnished upon request.

### In Western States

PATTIN expansion shells are available and serviced exclusively through The Colorado Fuel & Iron Corp., Denver, Colorado.

# PATTIN

MFG. COMPANY

Marietta, Ohio

Est. 1888

## Michigan Geologic Maps

The U. S. Geological Survey has published geologic maps of four quadrangles in the Michigan copper district which show the bedrock geology of the area between Calumet and Painesdale, Houghton County.

The maps were compiled largely from subsurface information obtained from mining companies by H. R. Cornwall, W. S. White and J. C. Wright. Outside the area underlain by the Portage Lake lava series, geologic boundaries shown on the maps are based on surface geologic mapping and on the results of ground and aerial magnetic surveys.

The geologic maps, which can be purchased for 50 cents each by mail from the Geological Survey, Washington 25, D. C., are: MF-43, Chassell quadrangle, Mich.; MF-46, Hancock quadrangle, Mich.; MF-47, Laurium quadrangle, Mich.; and MF-48, South Range quadrangle, Mich.

## The Ireland Mine

The new coal mine of Pittsburgh Consolidation Coal Co. for which ground has already been broken at Cresaps, W. Va., has been named the Ireland Mine. This is in honor of R. Livingston Ireland, director and chairman of the Executive Committee of Pittsburgh Consol. and director of the M. A. Hanna Co.

The mine, slated to go into production in August 1956, has a planned output of 2,000,000 tons a year within two years.

## ORA Moves Office

The executive offices of the Ohio Reclamation Association have been moved from Cleveland to Cadiz, Ohio. Field offices of the Association have been located in Cadiz for some time. Address for the combined offices is now First National Bank Building, Cadiz, Ohio.

## More Water-Borne Coal

Goaded by ever-mounting rail freight rates, the bituminous coal mining industry is turning more and more to water-borne deliveries in its efforts to keep coal on a competitive basis with other fuels.

Scores of new coal docks were built in 1955 on the Ohio, Illinois, Mississippi, Monongahela, Allegheny, Tennessee, Kentucky, Kanawha and Green Rivers and the Warrior-Tombigbee Waterway in Alabama. On the 652-mile Tennessee River alone, 23 of the 129 barge terminals are for exclusive handling of coal, and seven of the 23 handle coal bound entirely for electric utility plants.

A new wrinkle in all-water haulage was jointly undertaken early this

## Wanted

Immediate opening on sales staff of internationally known manufacturer of tunneling machinery with headquarters in Chicago. Prefer graduate engineer of some experience with tunnel contractor. Willing to travel. Address replies to Box 713. Will arrange for interview.

spring by Truax-Traer Coal Co. and United Electric Coal Co. in conjunction with the Material Service Corp., Chicago. In this project, coal from nearby mines is loaded in barges at Liverpool, Ill., and transported to Chicago via the Illinois Waterway. It is then transhipped in lake vessels to Great Lakes ports, with the first shipload of 8000 tons going to the Consumers Power Co., Muskegon, Mich.

If the method proves practicable, the two companies and others are expected to build permanent facilities at Chicago for the transfer of coal from barges to Great Lakes ships.

## Authorized Rebuilding

An agreement with several companies as authorized agents for rebuilding Jeffrey mining machinery has been announced by Jeffrey Mfg. Co., Columbus, Ohio. These companies include: Galis Electric & Machine Co., Morgantown, W. Va.; National Electric Coil Co., Bluefield, W. Va.; and National Electric Service Corp., Harlan, Ky.

## To Open Asbestos Mine

National Gypsum Co. of Buffalo, N. Y., has revealed that development work will begin soon on a new multi-million-dollar asbestos mine and plant at Thetford Mines, 75 miles southwest of Quebec.

The announcement said, "The new mine and plant will supply asbestos fibre to National Gypsum Company's three asbestos-cement plants at Millington, N. J., St. Louis, Mo., and New Orleans, La."

National Gypsum last year purchased a tract of land from Bell Asbestos Mines Ltd., a subsidiary of Turner-Newall, London. The company since has acquired additional land and now owns a 500-acre tract.

National Gypsum operates what is considered to be one of the largest gypsum mining developments in North America at Halifax, Nova Scotia.

The new mine and plant will be operated under the name of National Asbestos Mines Ltd., a wholly owned subsidiary of National Gypsum Co.

The announcement revealed that the project is expected to be completed in 1958. Service buildings and roads will be constructed this year. Development work on the mine will be started either late this year or early next year.



## Reopen Eccles No. 5

The Eccles No. 5 mine of Eastern Gas and Fuel Associates, closed since early 1953, was reopened in late March. The former steam hoist at the mine near Beckley, W. Va., has been electrified and old cleaning equipment has been replaced by a small calcium chloride cleaning plant.

Plans are said to call for a gradual step-up in coal production over a period of several months, pointing toward ultimate daily output of 1500 tons and a payroll of about 125 men.

## Enters Titanium Field

Illinois Zinc Co., New York, has entered into an agreement whereby the company will become a substantial stockholder of Continental Titanium Corp. Continental Titanium owns a process for producing titanium metal in ingot form.

Illinois Zinc Co. is also negotiating with Hayden Projects, Inc., New York, on the terms of a merger of the two companies. The agreement has been approved by the directors of both companies subject to certain conditions now being resolved and it may be submitted for approval of the stockholders in the near future.

Hayden Projects holds licenses from Chemetals Corp. for the hydrometallurgical treatment of copper scrap, ore and concentrates, and for the rolling of nonferrous metal products.

## Pocahontas Fuel To Up Production

At a stockholders meeting of the Pocahontas Fuel Co., Pocahontas, Va., in late March, plans were revealed for the reopening at an early date of the Trimore mine in Tennessee. The installation of additional coal cleaning facilities at the Jenkinjones, Deerfield, and Crane Creek mines, the stockholders were told, will be completed in the next few months. At that time it will be possible to step up production according to the company.

## More Coal Pipelines Suggested

Pipeline transportation of coal over much longer distances than now planned was suggested in Pittsburgh Consolidation Coal Company's annual report to shareholders as one way to push the bituminous industry's battle for bigger markets and against high railroad freight rates.

The report warned railroads that the coal industry and its customers "may be compelled to develop every alternate means of delivering the country's increasing requirements of coal-based energy."

Pitt Consol, the world's largest bituminous coal producer, is already pioneering in the development of pipe-

line haulage of coal. It is building a 110-mile pipeline from eastern Ohio to Lake Erie which it hopes to have in operation early next year.

The company's report cited coal pipelines as "analogous to those used in the oil and gas industries," and suggested that "this new concept of moving coal to a point of use may be applicable to the transmission of large tonnages over any conceivable distances."

The company believes it completely feasible to build a new pipeline from the bituminous fields of West Virginia and Pennsylvania 300 miles to the East Coast.

The report said that while most of the company's increased output planned for 1956 will be at rail mines, its river shipments have increased in the past decade to the extent that the firm bought three new diesel towboats and more than 100 barges.

## New Plant for N. J. Zinc

The New Jersey Zinc Co. has acquired the plant of the American Cyanamid Co. at Gloucester City, N. J. New Jersey Zinc plans to manufacture titanium dioxide pigments at the plant which was transferred to their ownership on May 1.

## EXECUTIVE RESPONSIBILITY

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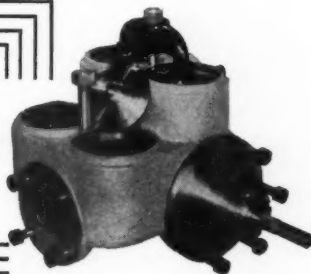
Submit details to Box No. 103.

## Acquires Seward Mine

North American Coal Corp. has acquired the Seward mine near Johnstown, Pa., in conjunction with the signing of a long-term coal supply contract between North American and the Pennsylvania Electric Co. of Johnstown, former owner of the mine.

The mine will be operated by a newly-formed subsidiary of North American, the Conemaugh Mining Co., and will be called the Conemaugh mine. Its production of 800,000 tons annually will boost North American's yearly bituminous coal production to well over 6,000,000 tons.

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### To Install New Furnace

Climax Molybdenum Company's pure molybdic oxide capacity, currently 2,700,000 lb a year, will be doubled by the now-underway installation of a second sublimation furnace at its Langeloth, Pa., plant. Rust Engineering Co., Pittsburgh, the contractor, expects to complete installation in September.

The Climax plant at Langeloth converts molydenite concentrates which it receives from the Climax, Colo., mine and mill into a number of products for the metallurgical and chemical fields, of which the pure oxide is one. Since molybdic oxide volatilizes at above 1100°F., the pure oxide is produced by sublimation.

### Push Coal Export Markets

West Virginia bituminous coal operators, UMW President John L. Lewis, and the three coal-carrying railroads which serve Hampton Roads, Va., are making a cooperative effort to enlarge the overseas coal export market. The railroads are the Norfolk & Western, Virginian, and Chesapeake & Ohio. Representatives of the three groups have been meeting in Washington, D. C.

One feature especially being looked into is the subject of ocean shipping and the desirability of stabilized ocean rates.

In 1955, 34,000,000 tons of bituminous coal were shipped abroad, mainly to Western European countries, in what has been described by the U. S. Department of Commerce as a billion-dollar-a-year business.

### Changes In Iron Mining Company

The contracting and mining business of E. W. Coons Co., Hibbing, Minn., is now being carried on by two separate organizations. The contracting business will be carried on under the name of E. W. Coons Co., headed by Walter E. Wilson. The mining business will be carried on under the name of Pittsburgh Pacific Co., headed by Hugh H. Harrison. Operation of the mining properties of the Pittsburgh Pacific Co. are being managed by Pacific Isle Mining Co., with offices at 2521 First Ave., Hibbing, Minn.

### Constructs Prototype Plant

Strategic Materials Corp., Montreal, Canada, expects to complete a prototype plant for the economic exploitation of low-grade manganiferous ore sometime this summer.

Strategic Materials reports it has developed an electric furnace process designed to produce aluminum oxide, titanium oxide and iron from high-ferrous bauxite. The process also yields these products from red mud slag, which is the waste remaining

after bauxite has been converted into alumina for further processing into aluminum.

After completion of the prototype plant for the production of ferro-manganese from low-grade manganiferous ore, Strategic Materials will start construction on a 75,000-ton-per-year capacity plant to be located near the company's Woodstock, N. B., manganese reserves, which are estimated to exceed 200,000,000 tons.

### River Tipple Site

A 26-acre tract of land at Catlettsburg, Ky., has been purchased by the Elkhorn Coal Corp. A spokesman for the purchasing company said there are long-range plans for development of a river coal terminal on the site. The tract is on the Ohio River between Ashland, Ky., and Kenova, W. Va.

Elkhorn Coal Corp. has major coal holdings and operates in Eastern Kentucky's Wayland area. Catlettsburg is less than 100 miles from the Elkhorn mines and properties of other companies which the river facility might serve.

### —BOOK REVIEW—

**GOLD MINING IN ONTARIO, by Committee of Inquiry into the Economics of the Gold Mining Industry, 1955. Chairman: Professor F. A. Knox, Head, Department of Political & Economic Science, Queen's University, Kingston. Published by Baptist Johnston, Toronto. 117 pp. Illustrated.**

A PROMINENT statesman from a free country once said, "For me gold is liberty." Gold is a significant topic of discussion at the present time because free people everywhere want to see the United States return to the gold standard. This book, "Gold Mining in Ontario," then is particularly timely.

On March 22, 1954, a Committee of Inquiry was appointed to conduct an inquiry and to study the economics of the gold mining industry in Ontario and submit a report. The terms of reference given to the committee were to examine and to report on: (a) the conditions affecting the present position of and prospects for the gold mining industry in Ontario; (b) the causes underlying trends in employment, wages, working conditions, profits, dividends, etc., in the industry; and (c) the effects of these developments on communities in the northern parts of the province.

The book, the result of the committee's investigation, is informative, well illustrated, and intensely interesting.



# Western States

## U. S. Steel Buys Claims

Columbia Iron Mining Co., subsidiary of U. S. Steel Corp., has purchased 18 iron ore claims in the Iron Mountain area west of Cedar City, Utah. Company officials reported that the purchase is part of a continuing program of acquiring raw materials for use at the Columbia-Geneva Steel plant at Geneva, Utah.

## Lucky Friday Shaft Working

The new Lucky Friday three-compartment shaft at Mullan, Idaho, is now in operation. The ore body on the 2300 level has been opened for a distance of 1200 ft, and the east face is presently showing 2½ ft of high-grade ore, according to C. E. Horning, Lucky Friday president. The ore body on the 2000 level was opened for about 1000 ft and an intermediate level has been opened on the 2150 level.

The new shaft, equipped with a 400-hp hoist, eliminates the hoisting bottleneck which had seriously handicapped operations below the 2000 level. Present production is 125 tons per day, Horning said.

## Add To Copper Reserves

Consolidated Coppermines Corp. has added about 26,000,000 tons of relatively low grade ore to reserves in the White Pine, Nev., district, according to Chester A. Tripp, president. He said the development indicates ten or more years of mining operations now in sight for the firm, providing there is a continuation of favorable copper prices.

## Uranium Mill Proposed

Lucky Mc Uranium Co. and Utah Construction Co. have submitted a proposal to the Atomic Energy Commission for construction of a 750 tpd uranium mill in the Gas Hills district of Wyoming. The proposed installation would also serve properties in the Riverton-Lander area.

Under the agreement with Lucky Mc, Utah Construction has been core drilling in the Gas Hills area during the past six months and, according to reports, has developed sufficient

ore reserves to support the proposed mill. It was pointed out that although the ores differ somewhat from the general Colorado Plateau type of uranium, the deposits are amenable to beneficiation and contain sizable reserves.

## Zirconium Plant Reopened

The Bureau of Mines' zirconium plant at Albany, Ore., is to resume production by June 1. It is reported the action is being taken at the request of the Atomic Energy Commission.

The capacity of the Oregon plant had reached over 280,000 lb a year prior to its shutdown in 1955.

## Polaris Development

Polaris Mining Co. is opening new ore bodies in the Silver Summit and Chester properties west of Wallace, Idaho, according to its annual report.

An ore-bearing structure located by diamond drilling on the 2500 level of the Silver Summit mine has now been explored partially by a tunnel. The Chester vein development is on the 3000 level. Tunnelling to a mineralized portion of the vein found by diamond drilling late in 1954 has so far opened ore over a length of 56 ft and average width of 6.2 ft.

An easterly exploration drift from the Silver Summit 3000 level penetrated 220 ft into the Rainbow Mining & Milling Co. property and will be continued 1500 to 1700 ft. Some mineralization has been found in the area and diamond drilling of the walls is planned.

## Ship California Copper

The New Penn Mine in Calaveras County, Calif., recently acquired by Standard Mining Corp., is now shipping ore from the 300 and 400-ft level at a rate of 50 tons per day, according to Howard S. Strouth, Standard president.

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Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. Advanced engineering design and custom-building to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

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Send us your haulage problem today!

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### Lead-Zinc Mill Moved

Atlas Uranium Corp. has announced that its 100-ton lead-zinc mill is being moved from storage in Montrose, Colo., to a mill site near Crested Buttes, in Gunnison County. Workmen are presently clearing a mill site and arrangements have been completed for building a power line to the location, according to J. C. Burgess, Atlas president. The mill should be ready for operation by June 15.

In addition to lead and zinc properties, the company has acquired 260 acres of coal land at the mill site and will mine its own coal as fuel for the mill, Burgess said.

### Progress at San Manuel

In its annual report to stockholders, the San Manuel Copper Corp. made known that haulage facilities and stope preparations in the San Manuel ore body, San Manuel, Ariz., are on schedule. Stope undercutting has been started and production is under way. It is expected that full production of 30,000 tons per day will be achieved by the middle of 1956. The crushing and concentrating plants were completed and preliminary milling started the end of September

1955. Ore was obtained from development and a stockpile accumulated from development done for the past several years.

The smelter was completed and smelting commenced in January 1956. On January 8, 1956 the first copper was poured as anodes and smelter production is continuing on a limited scale to conform with mine and mill production.

San Manuel is a wholly-owned subsidiary of Magma Copper Co.

### Tungsten Plant Expansion

The Salt Lake Tungsten Co. has completed an expansion program at its Salt Lake refinery which included the addition of an ammonia paratungsten plant to produce a material easily convertible to powdered tungsten for the metallurgical trade.

### Nevada Gold-Uranium

Minerals Engineering Co., Grand Junction, Colo., has taken an option on a gold-uranium property of the Atlanta Gold & Uranium Co., 30 miles north of Pioche, Nev., according to Blair T. Burwell, Minerals Engineering president.

Under the option agreement, Minerals Engineering will investigate the commercial possibilities of transforming the underground property to an open pit producer of gold and uranium.

On the basis of preliminary reconnaissance, Burwell estimates that there are about 1,400,000 tons of gold-uranium ore in the deposit. Should the present examination lead to production, Minerals Engineering would finance the construction of a 500-ton per day mill at the property.

### Wheels of Government

(Continued from page 79)

eral Government would have a surplus of \$2 billion in the fiscal year ending June 30.

The Joint Committee, however, cast a cloud over tax reduction possibilities. It said that tax reduction is not advisable under present conditions. In addition, strong supporters of a sound fiscal system are opposed to tax reduction until payments have been made on the Federal debt. Influential members of the tax-writing House Ways and Means Committee are also known to be cool toward any reduction at this session.

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Dooley Bros. Track Mounted drills, two drill arms mounted, on 42" Track Gauge self-propelled truck, 260 V. D.C.

600 ALL STEEL PIT CARS

Capacity 4.4 tons, 42" track gauge, end dump.

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Jeffrey 8H-48, 8H-60 Aerodyne Mine Vent Fan with V Belt Drive.

7 AU Joy Sullivan Track Mounted Cutting Machines.

7 B-1 Sullivan equipped with Joy bugbusters on Caterpillar trucks.

Jeffrey single roll 36" x 45" Coal Crusher. Jeffrey Air Operated Jig consisting of Standard Two-Compartment Five-Cell Baum Type Jig with 84" wide Screen Compartment to handle 500 tons per hour.

300 K.W. WESTINGHOUSE MG SETS consisting of: Motor 432 H.P. Synchronous, 2200 volts; Generator 275 volts, D.C., 1090 Amps. Complete with starting equipment.

ELECTRIC MOTORS—1/4 H.P. to 25 H.P. Mine hoisting equipment and service parts for Mining Equipment.

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# Los Angeles Bound

**With Southern California's Great Metropolis as Host,  
Final Plans for the 1956 A.M.C. Convention and  
Exposition are Taking Shape**

EXTENSIVE interest throughout the mining industry in this year's Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress, to be held October 1-4 at the Shrine Exposition Hall in Los Angeles, is indicated by the scores of suggestions for the convention program currently being received by convention officials.

These suggestions will be sifted and augmented by the State Chairmen of the Program Committee who will meet in Los Angeles in June under the general chairmanship of Walter C. Lawson, general manager, Phelps Dodge Corp., Douglas, Ariz. They will be assisted in the task of rounding out a comprehensive, hard-hitting program by a large representative committee from all sections of the country.

The meeting's agenda will include discussion of a wide range of matters such as mine taxation, mineral tariffs, labor relations, stockpiling plans, monetary policies, public land laws and their administration, the future outlook for various metals and minerals in our economy, and ways and means of reducing costs and increasing efficiency at mining operations and treatment plants.

Not only executives of mining companies, but superintendents of mines, quarries, mills and smelters, engineers, shift bosses, electricians, mechanics, machine operators, drill runners and just about all other employees will do a more effective day's work when they practice the lessons learned at the convention sessions. Of equal value will be the opportunity to inspect the newest equipment displayed in the wide variety of exhibits. Each visitor will be able to discuss his operating problems at first hand with the manufacturers' technical staffs while viewing the latest developments in mining machinery, equipment, and supplies.

With more than 150 manufacturers and suppliers to the mineral industry participating, every type of surface and underground mining machinery, together with milling and metallurgical equipment of all kinds, will be on display. How better could a mining man gain familiarity with the ever-changing equipment so important to his daily work or expose himself to a better environment to spark his imagination toward cost-cutting ideas?

Convention-goers will be offered their usual bonus of gala parties

rounded out with topnotch entertainment. The Miners Jamboree, to which of course everyone is invited, will take place Tuesday night, October 2, in the Hollywood Palladium. There will be dancing after dinner as well as a fine floor show. On Thursday, October 4, the annual Speechless Banquet, winding up the eventful week, will be held in the Cocoanut Grove and the Embassy Room of the Ambassador Hotel.

Two special events are planned exclusively for the ladies—a Welcoming Luncheon in the Biltmore Bowl on Monday, October 1, and a luncheon and style show at the Beverly-Hilton Hotel on Wednesday, October 3.

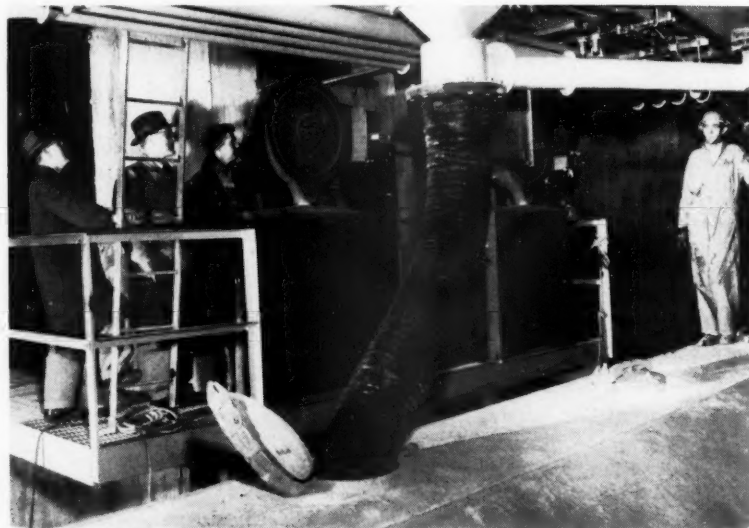
Los Angeles and Southern California abound with attractions for visitors, including famous restaurants and fun spots, movieland, shops, golf courses, mountains and beaches. A trip through one of the best-known attractions, Walt Disney's popular Disneyland, is scheduled for Friday, October 5.

Other special trips slated for Friday will give Convention visitors an opportunity to visit nearby mining and industrial operations, including a steel mill, cement plant, mechanized rock products operation, oil refinery, diatomaceous earth production, and a view of Los Angeles Harbor. Complete details on trips and entertainment functions, together with order forms, will be mailed out in June. Make your plans now to order tickets promptly.

Requests for hotel reservations are now being processed. If you haven't already done so, rush your application today to the American Mining Congress Housing Bureau, Los Angeles Chamber of Commerce, 1151 South Broadway, Los Angeles 15, Calif.

See you in Los Angeles!

## Open New Cement Distribution Plant



Each of the four new silos (left) has a capacity of 10,000 bbl of cement. Automatic weighing (right) helps load a truck with 120 bbl of cement in ten minutes.

A \$600,000 investment for better service—that in a few words sums up Olympic Portland Cement's new distributing plant just north of the Spokane Street bridge on Harbor Island in Seattle. The new facility was formerly opened March 16.

Outstanding features of this new addition to Seattle's industrial skyline are the four huge silos towering six stories above the ground. Each holds 10,000 bbl of cement.

The cement arrives at the new Olympic Portland Cement distributing center on the Duwamish River via a closed metal barge from the

firm's plant at Bellingham. The cement is then pumped from the barge to the storage silos through a 200-ft, 8 in. diameter seamless steel pipe.

All conveying of cement at the new facility is by the "Air Slide" method (when air is forced into dry cement it "flows" much like water.)

Two trucks may be loaded at one time from two silos each. It takes just ten minutes for a truck to receive a 120-bbl load and be on its way to the job.

A novel installation is the special scales which weigh the load on each axle, then cut off the flow when the

predetermined load has been delivered. This permits maximum loading without danger of either overloading or improper loading.

The installation of a plant-wide dust collector system virtually eliminates the dust problem usually associated with cement loading.

A new packaging plant adjoins the bulk storage facility. The new packer machine is supplied from all four bulk silos. The sacked cement is loaded onto trucks at a rate of 1000 sacks per hour by a reversible conveyor.

### U. S. Fuel Improvements

United States Fuel Co. has announced that it has completed installation of new coal preparation facilities at its Hiawatha, Carbon County, Utah, mines. Newly installed equipment includes a rotary dump, a Bradford breaker, two boom conveyors, and reciprocating feeders. The two boom conveyors allow the stockpiling of coal to permit surge capacity ahead of the coal preparation plant. The reciprocating feeders are used to feed coal from the stockpile to belts for conveying to the preparation plant.

### Manganese Sale

World Manganese Corp., a wholly-owned subsidiary of the World Church of Los Angeles, has acquired the manganese properties of the White Canyon Mining Co., located in the Artillery Peaks district near Stovall, Ariz.

World Manganese is buying the properties, in part, to obtain milling facilities, as the firm previously had acquired manganese claims in the district.

### Uranium Claims Patented

Mineral patents were issued on March 16 to the Utex Exploration Co., Moab, Utah, covering 13 claims originally located by Charles A. Steen, Utex president. The claims patented were the Mi Vida, Mujer, Sin, Verguena, Mi Corazon, Besame Mucho, Pisco, Fundadora, Te Quiero, Linda Mujer, Mi Amorcita, Mi Alma and Barcardi.

According to the Bureau of Land Management, these were the first mineral patents issued on claims originally located on a discovery of uranium, and are the first mineral patents containing a reservation to the Government of Leasing Act minerals under Public Law 585, 83rd Congress.

### Idaho Geological Pamphlet

The Idaho Bureau of Mines has reported that a new pamphlet on geological formations in Idaho is now available at the University of Idaho for \$1 a copy. The report covers an area extending across the borders of Utah and Wyoming and is entitled "Geology of the Southeast Portion of the Preston Quadrangle, Idaho."

### Consider Wyoming Uranium Mill

A proposal to build a new uranium concentrating mill at Riverton, Wyo., with private financing supplied in part by Norbut Corp. of New York, has been filed with the Atomic Energy Commission. Lost Creek Oil & Uranium Co. of Rawlins, Wyo., has concluded an agreement with the New York concern, looking toward its eventual merger into Norbut, according to Robert Adams, Lost Creek president.



## AEC Monticello Mill

National Lead Co. assumed operation of the Atomic Energy Commission uranium processing mill at Monticello, Utah, on April 1, according to Joseph A. Martino, president.

The Monticello mill had been operated for the Commission since 1949 by the Galigher Co. of Salt Lake City, which advised AEC it did not wish to renew its contract. The National Lead Co. is also operating the raw materials development laboratory at Winchester, Mass., and the ore testing power plant at Grand Junction, Colo.

## Develop Nevada Tungsten

American Duchess Uranium & Oil Co., Salt Lake City, has purchased with Luta Uranium & Oil Co., Inc., a 50 percent interest in a 140-acre tungsten property near Tonopah, Nev. A contract has been signed with Union Carbon & Carbide Corp., (U. S. Vanadium) for delivery of a minimum of 3500 tons of tungsten ore monthly to the latter's mill at Bishop, Calif. Reserves at the Tonopah property are estimated at 200,000 tons.

## To Build Uranium Filters

Peterson Filters & Engineering Co., Salt Lake City has contracted to build filtering equipment for the new 5700-ton-a-day uranium mill being erected in Canada's Blind River district by Consolidated-Denison, Ltd. Sixty percent of the contract will be completed by a Peterson Canadian affiliate with the remaining 40 percent of the work being done in the United States.

## Golden Cycle Contract

Golden Cycle Corp. has signed a contract with the Byden Mines, Inc., under which Golden Cycle will assume operation and management of all properties owned or leased by Byden and will eventually own a 51 percent interest in the company, according to Merrill E. Shoup, Golden Cycle president.

Byden is now operating properties known as the Saytah group and the Silentman group, located about 35 miles west and north of Shiprock, N. M. Byden was also the successful bidder on additional tracts of Tribal land in the Monument Valley district, south of Mexican Hat, Utah. On this land Byden has 18 months in which to select ground upon which it will receive a mining lease.

"We believe that between the Saytah-Silentman groups and the Monument Valley properties, we can within a few months expect steady shipments of ore to the mills at Shiprock and Monticello," Shoup said.

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## Map Expansion Plans

A multi-million dollar "Horizon Plan" for the future development of the Colorado School of Mines has been announced by Dr. John W. Vanderwilt, president of the college. While paying tribute to the State of Colorado for its backing in the past and expressing confidence in continued state support in the future, Vanderwilt pointed out that supplementary non-state funds will be needed if the college is to meet its obligations. He cited goals of over \$20,000,000 in capital funds and \$450,000 in annual funds to augment state support by the school's centennial year in 1974.

Vanderwilt said the "Horizon Plan" will include emphasis upon continued improvement of teaching at the college, research and advanced study, student aid through scholarships and fellowships, and an extensive building program requiring over \$10,000,000 in the next 20 years. Urging broad participation in the new effort, Vanderwilt said the "Horizon Plan offers opportunity for individual and corporate participation in the future of the school."

## U-Mill for Grants, N. M.

A newly formed company, Foley Metals Corp., is negotiating with the Atomic Energy Commission for a contract to build and operate a large uranium ore custom processing mill to treat ores from and tributary to the Ambrosia Lake area near Grants, N. M. The stock of this company will be owned by three groups, the Foley group, Rio de Oro Uranium Mines, Inc., and the United Western Minerals group.

Extensive core drilling has indicated

that Rio de Oro has one of the largest ore bodies in the newly discovered Ambrosia Lake area. It is the only one which has a shaft completed into the ore and on which mining operations have commenced.

The United Western Minerals' ore body, which is also believed to be one of the larger in the Ambrosia Lake area, is owned 50 percent by United Western Minerals Co., 50 percent by three groups—J. H. Whitney & Co. of New York, White Weld & Co. of New York, and San Jacinto Petroleum Corp. of Houston, Tex. United Western has done a great deal of drilling in proving up its ore body and is going to commence sinking a shaft in the immediate future.

The Ambrosia Lake area has been a comparatively recent uranium discovery, but extensive drilling activities by numerous companies have indicated that it may be an extremely important one.

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## Utah Construction To Peru

Utah Construction Co. has been awarded the contract for erection of a power plant, concentrator, railroad and other main mine surface structures at the Toquepala, Peru, properties of Southern Peru Copper Co., according to M. S. Eccles, board chairman of U-C. Morrison-Knudsen Construction Co., Boise, Idaho, is associated in the venture with U-C.

U-C recently completed the opening of the San Manuel copper pit for Miami Copper Co. and currently is engaged in a joint venture with Cyprus Mines Ltd. and Union Oil Co. of California in developing an open pit in the Pima, Ariz., copper district.

## New Park Ore

New Park Mining Co. has encountered expected bedded lead-silver-zinc ores at the east end of the Park City mine on the 1780-ft level, W. H. H. Cranmer, president, has announced. The ore body is in step-faulted limestone and extends up to the 1600-ft level, where indications of bedding were encountered for the first time in the New Park mine.

## Reservation Lease Granted

The second uranium lease on Spokane Indian Reservation tribal land has been granted by the Department of Interior to Big Smoke Uranium, Inc. The first such lease was granted about 18 months ago to Midnite Mines, Inc., covering the original uranium discovery on the reservation in southwestern Stevens County.

The Big Smoke lease is for 160 acres, upon which the firm is developing a deposit of uraninite, and runs for ten years and as long thereafter as ore is produced in paying quantities. Initial exploration activities on Indian reservations are carried out under prospecting permits by ruling of the Federal Government.



Governor John Simms of New Mexico (left) and Edward Arthur, Mining Commissioner for the Los Angeles Chamber of Commerce, are among the many prominent people who are giving their enthusiastic support to the 1956 Mining Show of the American Mining Congress. To be held October 1-4, 1956, in Los Angeles, the Metal Mining and Industrial Minerals Convention and Exposition promises to be another outstanding affair that will be attended by several thousand mining men.

## Kennecott Sells Housing

In order to make its housing units available for purchase by employees on reasonable terms, Kennecott Copper Corp. has sold its community townsites in four states to an independent realtor, C. D. Michaelson, general manager of Kennecott's Western Mining Divisions, has announced.

By selling its housing units and utilities, estimated to involve \$5,000,000 worth of property in New Mexico, Utah, Nevada and Arizona, Kennecott will discontinue its role of landlord and encourage home ownership among its employees, Michaelson said.

The new owner of the townsites is John W. Galbreath & Co. of Columbus, Ohio, which has handled numerous housing projects in various parts of the country. Kennecott indicated that Galbreath probably will require about six months to complete the entire program. Property now leased to churches and schools will be deeded by Kennecott to those institutions.

Communities affected are Hurley and Santa Rita, N. M., McGill, Ruth and New Ruth, Nev., Copperton, Garfield, Magna and Arthur, Utah, and Ray and Hayden, Ariz.

## Phillips U-Exploration

Amurarium Corp., Washington, D. C., has negotiated a contract with Phillips Petroleum Co., covering exploration of 1500 acres of Amurarium ground in the Big Indian district, San Juan County, Utah. Phillips has agreed to drill ten deep uranium holes, after which it may elect to put down an additional 20,000 ft of drilling for a 50 percent working interest in the mining claims and leases, according to T. Peter Ansberry, Amurarium board chairman. Phillips would be the operator in the event of discovery.

## Uranium In Lignite

Arrangements have been concluded with the Atomic Energy Commission by the Ohio Oil Co., Findlay, Ohio, in association with Arthur E. Pew, Jr., Philadelphia, looking toward the sale of uranium concentrates to AEC.

J. C. Donnell II, president of Ohio Oil, said the associates propose to produce the uranium concentrates from uraniferous lignite ores which are known to exist in the western part of North and South Dakota. The lignites cannot be treated economically by the metallurgical techniques applied to standard uranium ores.

The associates have conducted considerable research, through the Catalytic Construction Co., toward developing an economic process for recovery of uranium from the lignites. Further development of the process will be conducted in a pilot plant at the Colorado School of Mines. Catalytic

Construction Co. has been retained to proceed with pilot plant operations.

Depending upon the pilot plant results and the determination of ore reserves, the associates will decide whether to enter into final negotiations with AEC for the construction of a mill and sale of concentrates. It is estimated that the mill, if constructed, may begin operations the latter part of 1957, and would provide a market for amenable lignites in the area.

## Tungsten Mill Working

The new Idaho Maryland Mines Corporation's tungsten mill has started operation at the mine site at Grass Valley, Calif. The company had been shipping tungsten ore to Lovelock, Nev., for processing. The mill is operating two shifts a day, seven days a week and is processing approximately 60 tons of ore per day.

## Promotions at Climax Molybdenum

Effective January 1, three production officials have been promoted to new positions at Climax Molybdenum Co., Climax, Colo., according to announcement by Robert Henderson, res-

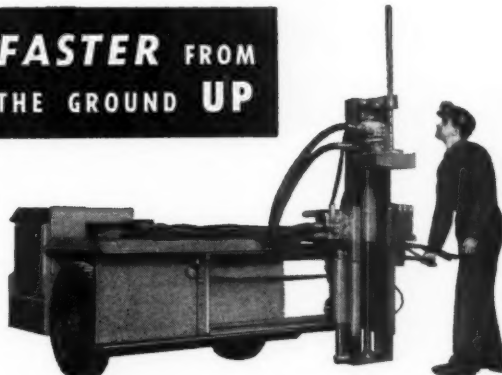
ident manager. Edwin J. Eisenach, assistant general superintendent since March of last year, has become general superintendent of Climax mining and milling operations. John M. Petty, mine superintendent, has advanced to the post of assistant general superintendent, and William F. Distler has been advanced from assistant mine superintendent to superintendent of the Mine Department. All three men are graduates of the Colorado School of Mines. Eisenach and Petty have been with Climax since 1942 while Distler worked for the Miami Copper Co. from 1939 to 1954 before joining Climax.

## Cog Minerals

Cog Minerals Corp., recently organized affiliate of Colorado Oil & Gas Corp., has acquired the assets of Midwest Consolidated Uranium Corp. Midwest had six operating uranium mines from which February shipments totalled 1056 tons.

The two principal producing properties include the Spook-Dee mine in San Juan County, Utah, and the Eureka-Buchhorn mine, Montrose County, Colo. Other assets of Midwest Consolidated to be acquired by Cog Minerals include approximately 800 claims on the Colorado Plateau.

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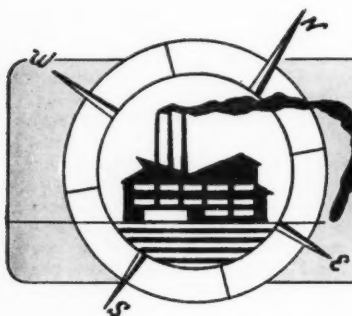


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# Manufacturers Forum

## Scraper

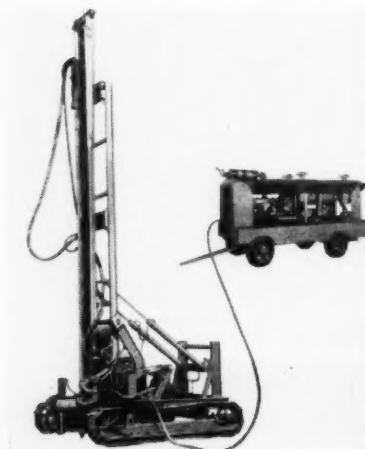
A NEW 18-CU YD SCRAPER has been announced by LeTourneau-Westinghouse Co., Peoria, Ill. Designated the Model C Fullpak scraper, the unit is built wider and lower than the company's previous Model C scraper but with greater ground clearance. It



features air brakes, control tower visibility, electric power and controls, a quick drop mechanism on the bowl lift, and an extra low push block specifically built to match push plate height of tractors now in the field. A specially curved deflector plate on top of the tailgate gives better "roll" to improve dirt's boiling action, according to manufacturer. Another aid is found in the matching of scraper load speed with pusher speeds.

## Rock Busters

TWO PIECES of heavy duty equipment for contractors, rock quarries and open pit mines have been announced by the Gardner-Denver Co. One is the Rotary 900 Portable Com-



pressor that delivers 900 cfm of air power, the other is a 5½-in. percussion rock drill.

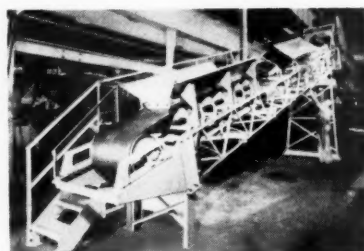
The two-stage compressor with normal operating pressure of 100 psi has a water cooling system and a clutch which disengages the compressor for easy engine starting.

The Model DH143 5½-in. drill offers the user a selection of bit sizes 3½ to 5 in. and is furnished with an air-powered crawler mounting which is self-propelled.

## Belt Conveyors

PRE-BILT sectional belt conveyors in standardized, pre-engineered units in capacities ranging up to 1500 tph are now available from Link-Belt Co.

Link-Belt Pre-Bilt belt conveyors incorporate standard Link-Belt compo-



nents, including the new Series 50 belt idlers, packaged with sectional truss frames and structural steel supporting bents. They are built in 18, 24, 30 and 36-in. belt width, with 24 and 42-in. deep trusses. Drives range up to 40 hp.

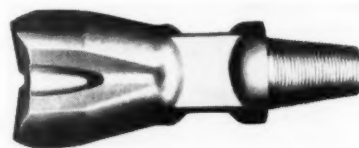
Descriptive information is available in Link-Belt Book 2579, from Link-Belt Co., Dept. PR, 307 North Michigan Ave., Chicago 1, Ill.

## Slip-Retardant Paint

AVAILABLE in light gray and maroon, this slip-retardant floor and deck paint has been introduced by the Finishes Division of E. I. du Pont de Nemours & Co. The slip-retardant agent in the enamel is nonmetallic and relatively soft. Applied by spray or brush, it has reportedly proved effective where oil, grease and water cause slippery surfaces.

## Rock Drill Bits

THE ADDITION of a six-in. Rok-Master to its line of percussion rock drill bits has been announced by



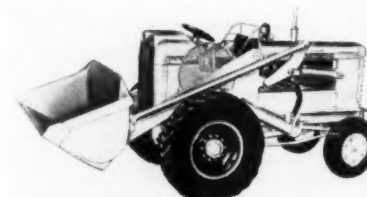
Chicago Brunner & Lay Rock Bit Corp., 9300 King St., Franklin Park, Ill. The bit is for use on I-R Quarry-master drills. It features 2 by 3 A. P. I. threads and fast drilling carbide inserts.

## Magnetic Disc Brake

INCORPORATING the advantages of solenoid operation, the HT-50 Through Shaft is designed so that the motor shaft extends right through the center and out beyond the end of the brake permitting drives off both ends of the shaft. The brake can be mounted on NEMA frames, 56-C, 66-C, 182 and 184. Write to Stearns Magnetic, Inc., Milwaukee 46, Wis., for Bulletin 2802.

## Front-End Loader

THE TRACTO-LOADER, model TL-11, has a 1½-cu yd capacity and is capable of turning in a radius of 12 ft 3 in. It has front wheel drive, rear



wheel power steering, a 3:1 torque converter, and a clutch-type transmission.

Power is furnished by either a 63-hp, 4-cylinder gasoline engine or a 77-hp, 6-cylinder diesel.

More information may be obtained from Tractomotive Corp., Deerfield, Ill.

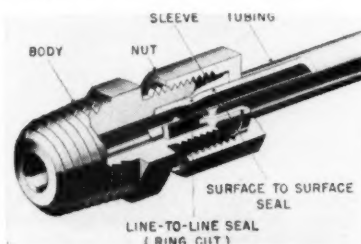
## Hydraulic Drill

ENGINEERED to operate as a core or auger drill, this hydraulically powered drill, designated Mobile Drill Model B-40, may be adapted for tractors and vehicles or independently driven by a motor mounted at the rear of any vehicle. For hard formations, either air or water may be used with hollow-stem augers. A 15-hp hydraulic motor is used. One-man operated, it can be converted to drill at any degree in a 360° angle, and is light enough for air transport to remote regions.

Contact Mobile Drilling, Inc., 960 North Pennsylvania St., Indianapolis 4, Ind., for further details.

## Self-Aligning Tube Fitting

A SELF-ALIGNING TUBE FITTING under the trade name "Self-align" can be installed without disassembling. The tubing is simply inserted in the fitting until it bottoms and the nut is tightened. According to the company, the dual sealing principle assures positive, leakproof connections, and they recommend the



"Selfalign" for instrumentation and all other low and medium-pressure applications using copper and aluminum tubing.

Various sizes from 1/8 to 1/2 in. in brass are available from stock; aluminum fittings are special to order. Further details may be had by writing to The Weatherhead Co., Fort Wayne Division, 128 West Washington, Fort Wayne, Ind.

## Pulley Lagging

RUBBER PULLEY LAGGING has been developed by Hewitt-Robins Incorporated to solve the problem of pulley slippage on belt conveyors operating on steep slopes or under wet service conditions.

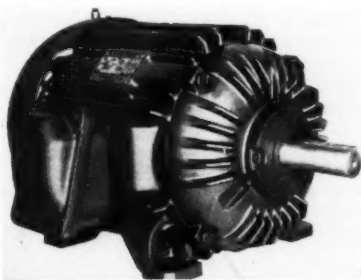
The lagging has a grooved anti-slip surface similar to the tread of snow and ice tires used on automobiles to give better road traction. Thousands of diamond-shaped rubber grippers press against the underside of the conveyor belt and minimize slippage when power is applied through the pulley. The lagging is reinforced with two layers of heavy fabric on the back to provide added strength.

The lagging will be sold under the

name of "Maltese Cross Double Chevron Pulley Lagging," and will be furnished in any width to fit all types of pulleys.

## Synchronous Induction Motor

THE SYNDUCTION MOTOR, developed for general industrial use by Allis-Chalmers Mfg. Co., Milwaukee, Wis., is available in ratings of 1/4 to

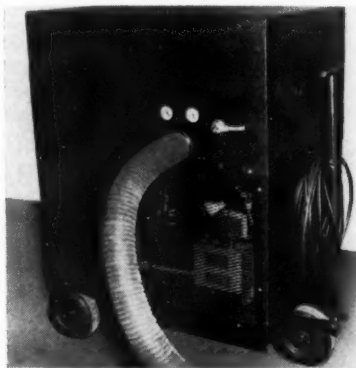


40 hp. Built on standard induction motor frames and enclosures and using a simple die-cast rotor, the machine requires no brushes, slip rings or windings on the rotor, separate source of direct current excitation, or special starting equipment.

The Synduction starts as an induction motor with a high locked-rotor torque, accelerates and pulls into synchronism, and runs as a synchronous motor. Having a high pull-out torque, the motor remains in synchronism regardless of load or line voltage fluctuations, according to A-C.

## Breeze Wagon

MOUNTED on a four-wheeled steel cart with pneumatic tires, this portable air cooling unit for industrial uses is marketed under the tradename



Breeze Wagon. The unit is designed to reduce the temperature in a hot, confined area such as a large tank or vat during maintenance or construction work, and will reportedly pump 500 to 1000 cfm of refrigerated air.

Further information may be obtained from Peuchen Engineering Corp., Box 1969, Wilmington 99, Del.

## Crawler Tractor

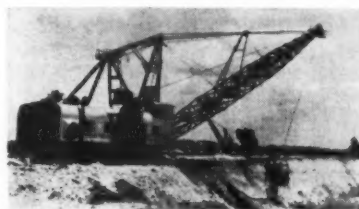
THE INTRODUCTION of its newest crawler tractor line, comprised of four models, the International TD-18, TD-14, TD-9 and TD-6, has been announced by International Harvester Co.

Principal engineering changes in these new models, according to the company's Industrial Power Division, are substantially increased hp ratings in the TD-6, TD-9, and TD-14; modern streamlined "new look"; better operator visibility; Cerametallic clutch facings; pressurized cooling systems; 500-hr track roller seals and all-weather, positive, easy-starting conversion systems.

## Draglines

A NEW LINE of Single Deck Walking Draglines has been announced by the Page Engineering Co., Clearing P. O., Chicago 38, Ill.

In capacities from 5 to 15 cu yd, the Page Models 721, 723, and 728 are powered by a V-type horizontal diesel



engine. An interesting feature of the engine is its automatic "power demand" control which automatically reduces or increases engine output as required by the machine going through its operating cycle.

Other features claimed are stronger, more rigid booms, greater horsepower, forced feed lubrication with electric oil pre-heater, and ease of maintenance.

## Torque Converter

THE THREE-STAGE 13,800 Series Torque Converter is designed specifically to accommodate a large number of engines for which previous models were not ideally suited, particularly in the oil fields and in industrial locomotives.

According to the manufacturer, the Series is planned around a simple basic unit with easy-to-add components which produce ten specific models. This arrangement permits flexibility, providing a model specifically adapted to a wide variety of applications. In addition this torque converter can be adapted, with appropriate engine speeds, to all engines in the 60 to 600-hp range by internal blading variations.

For more information, contact Twin Disc Clutch Co., Hydraulic Division, Rockford, Ill.

## Improve Scraper Line

DESIGN CHANGES have been announced in the 1956 International Harvester Co. self-propelled, rubber-tired Payscraper line. The two new Payscraper models are the 262-hp "75" and the 172-hp "55."

The model 75 capacity has been increased to 20 cu yd heaped and the model 55 to 14 cu yd heaped. Other



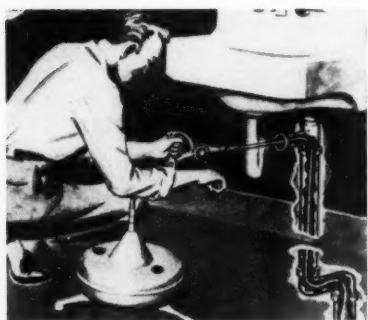
changes now engineered in the new units are: (1) straight-back bowl; (2) lower draft frame; (3) greater visibility; (4) new cerametallic clutch facing (on the "75"); (5) higher apron lift; (6) bigger push block; and (7) improved ejector.

## Heated Screen

FOR OPERATIONS where screening is difficult because of damp or sticky materials, a heated screen has been developed by Simplicity Engineering Co. of Durand, Mich. The Simplicity 4 by 8-ft Model SS heated screen has 35 sq ft of available screening surface. The transformer is a dust tight unit with a built-in overload switch.

## Pipe Cleaning Unit

THE Miller Rod House is designed to clean out drain and sewer stoppages. To operate turn the speed handle and the Miller Rod is whirled



down the pipe cleaning out rags, scale, sand, grease, and other obstructions.

For catalog write to Miller Sewer Rod Co., 4640 North Central, Chicago 30, Ill.

## Filter Felt

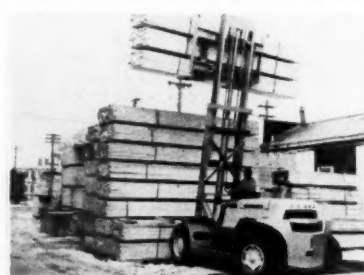
FEON ORLON FILTER FELT, developed by packing the interstices of a special orlon woven fabric with short fibers of orlon, reportedly combines high chemical and temperature

resistance with very high bursting strengths. It contains no bonding resin, hence may be used for any chemical or temperature problem where orlon itself is recommended. Principal application will be in filter presses and dust collectors.

Further information is available from Filtration Fabrics Division, Filtration Engineers Inc., 155 Oraton St., Newark 4, N. J.

## Fork Truck

NAMED THE YL-150, this 15,000-lb capacity, dual wheel drive, pneumatic-tired fork truck was designed specifically for lumber handling and heavy outside work. Powered with a Hercules JXC gas engine of 282-cu. in. displacement, the machine has a full-load road speed of 20 mph, 30-percent gradeability and a lift speed of 50 fpm. Other features include power



steering, hydraulic 16 by 4 power brakes, and an outside turning radius of 160 in.

Further information on the YL-150 may be obtained by writing to Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich.

## Feeder-Scalper

SOME of the features claimed for the Universal Wobbler, a feeder-scalper, are: ability to take heavy drop loads, separation of fines from oversize in wet sticky materials, low head room, freedom from vibration and noise, and control of scalped product size without expensive mechanical changes.

Literature will be furnished on request by the Universal Engineering Corp., 625 "C" Ave., N. W., Cedar Rapids, Iowa.

## Mobile Diesel Center

THE SERVICE DIVISION of Cummins Engine Co., Inc., Columbus, Ind., is now sending a "Mobile Diesel Center" to the field.

According to H. E. Bollwinkel, Cummins' executive service manager, "The purpose of the mobile demonstration unit is to bring the latest service information on Cummins diesels directly to service men throughout the country." They expect to contact 10,000 service personnel within the next 12 months.

## Truk-Boy

THE TRIPL-DUTY TRUK-BOY offers a method of handling acids and other liquids. The truck offers placement in the carboy tilter. Locking device permits tilter to be held in a



rigid position for loading, so the whole operation can be done by one man.

Complete information is available from the General Scientific Equipment Co., 27th & Huntingdon St., Philadelphia 32, Pa.

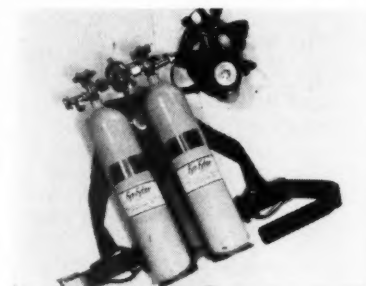
## Conveyor Protection

AN AUTOMATIC SAFETY CONTROLLER, which provides warning and prevents damage from abnormal load conditions of any kind on electrically driven conveyor systems, has been announced by the Tipp Mfg. Co., Tipp City, Ohio. A self-contained package that combines all the features of fuses, circuit breakers, ammeters and tong testers, the unit automatically shuts off the conveyor system at any predetermined load setting. It may also be set up to give warning or alarm of impending trouble before the shutoff stage is reached. The electro-mechanical device, called the Tipp-Tronic, is not affected by line voltage variations.

## Air Mask

AN AIR MASK that weighs 35 lb has been developed by Fyr-Fyter Co., 221 Crane St., Dayton, Ohio.

The mask is designed for use in the petroleum, chemical, coal and steel industries and in fire fighting, rescue, tunnel and sewer work, among other



applications where gas, fire and lack of oxygen are hazards.

Fyr-Fyter air masks are equipped with two cylinders, each holding 26 cu ft of air, that are mounted on the wearer's back. Air is not released until the operator inhales through the demand valve in the face piece, and a bell warns the operator when the air or oxygen supply nears exhaustion.



## Electric Truck

AN ELECTRICALLY-POWERED truck for underground hauling has been designed and manufactured by Kenworth Motor Truck Co.

Powered by electric traction motors, the end-dump truck receives current from overhead wires through a trolley. The truck also is equipped with a cable reel so the operator can maneuver away from the overhead wire zone. Motive and control electrical equipment for Kenworth's 802-E is manufactured by General Electric Company's Locomotive and Car Equipment Department.

Capacity of the new Kenworth truck is 16 cu yd struck, or 24 tons. The heaped load capacity is 19 cu yd. Gross vehicle weight is 93,000 lb.

The 802-E wheelbase is 14 ft. Overall length is 24 ft 10 in. with an



over-all width of 11 ft six in., and an over-all height of 11 ft 10 in. The one-man offset cab is enclosed and has access doors on both sides.

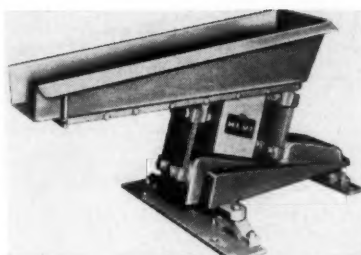
The 550-v main traction motor is located where the transmission would be located in a diesel-powered truck. An auxiliary 550-v motor is located under the hood to power air compressor, power steering, hoist pump and the lighting system.

## Mixer

REPORTED rugged and simple, the K Series Top Entering Mixer, turbine or paddle type, provides speed changes and interchangeable gear clusters. For more data contact The Cleveland Mixer Co., Box 197, Bedford, Ohio.

## Magnetic Vibratory Feeder

DESIGNATED the Eriez HI-VI Electro-Permanent Magnetic Vibratory Feeder, these units operate directly on 115 v or 230 v ac, without a rectifier, and have an electro-permanent magnetic drive that eliminates the need for bearings and friction-producing parts. Designed for such operations as feeding, mixing, drying, cooling, packing, conveying, and spreading, the new HI-VI units can handle a wide variety of bulk materials. An important factor is that flexible control of the feed rate



is obtainable with the use of the HI-VI remote controller, a rheostat to vary the voltage across the unit.

Three standard models are currently available, and detailed information concerning them may be obtained on request from Eriez Mfg. Co., Erie 6, Pa.

John E. McGrath has been promoted by the U. S. Steel Corporation's American Steel & Wire Division to the post of assistant manager of sales for the St. Louis District with offices in Kansas City. McGrath moves up from manager of market development for the company.

The appointment of William B. Hicks as manager of sales development in the rock products industry was announced by Hewitt-Robins Incorporated.

Organization of a firm for general consultation on all aspects of air pollution has been announced today by Wesley C. L. Hemeon, formerly engineering director of Industrial Hygiene Foundation and senior fellow of Mellon Institute. Hemeon is director of the new firm, known as Hemeon Associates. Headquarters offices and laboratory are in the Loeffler Building at 121 Meyran Avenue, in the Oakland section of Pittsburgh.

Lyle M. Schlekau and Woodford M. Babbitt have joined the staff of the E. J. Longyear Co. Schlekau will be the new time study and methods engineer. Babbitt has been assigned to the field as supervisor.

John D. Fess has been appointed district manager of the Pittsburgh office of The Okonite Co. James B. Caldwell, who had previously been assigned to the Okonite Los Angeles office, will assume the position of branch manager at Portland, while Edwin R. Conklin will become branch manager at Seattle.

Marion Power Shovel Co. has announced an expanded sales organization for the central states, headed by E. E. McCartney, Jr., newly appointed central sales manager. Three divisional sales managers have been

## Coal Mining Bits

TWO NEW carbide-tipped, coal mining tools have been added to the standard line of mining tools offered by Carboloy Department of General Electric Co., Detroit.

One of these is a medium duty undercutter bit with stop, referred to as the CCS-1, and the other a coal recovery auger bit, called the CCA-1.

The former is for use on short wall and universal cutting machines. It is similar to Carboloy's CC-1 tool, but differs by the addition of a stop that automatically sets the gage of the tool. The second new tool is specifically designed for coal recovery augers, but may be used on certain cutting machine applications. Both feature heat treated steel shanks.

## — Announcements —

named to work with him on sales and service of Marion machines in Illinois, Michigan, Wisconsin, Indiana and Kentucky. They are L. G. Currie, W. A. Shay, Jr. and R. B. Falck.

Promotion of Homer W. Sharpenberg to general manager of Manu-Mine Research and Development Co., Reading, Pa., has been announced.

Stratoflex, Inc., has announced promotion of C. A. Thomas to general manager of sales for the organization.

Warren L. Howes has been appointed manager of Western Knapp Engineering Co., division of Western Machinery Co.

J. H. How, president, Western Machinery Co., has announced the appointment of John P. Hamm as assistant to the president.

John M. Westfall is a recent appointee to the sales staff of Goodman Mfg. Co. Westfall had previously been associated with Uniontown Coal Mining Co. in an engineering capacity and with Du Pont as a technical representative.

George W. Russell was recently named general manager and Alden R. Loosli was named assistant general manager, of American Cyanamid Company's Industrial Chemicals Division.

The Ore & Chemical Corp. has appointed the following sales representatives, for the metallic and non-metallic mining industry; The Galigher Co., Salt Lake City, for the territory west of the Rocky Mountains, and Continental Sales & Equipment Co., Hibbing, for Minnesota, Wisconsin and Upper Michigan.

SEE NEXT PAGE FOR CATALOGS—BULLETINS.

## CATALOGS & BULLETINS

**ALLOY AND STAINLESS STEELS.** *Electric Steel Foundry Co., 214 N. W. 25th Ave., Portland 10, Ore.* Purpose of catalog 175-A is to show how the company can help achieve new and better solutions to problems of corrosion, heat, impact or abrasion. Data on corrosion resistant alloys, cast alloys, heat resisting alloys and information on stainless steel in many forms is included.

**BLASTHOLE DRILL.** *Ingersoll-Rand Co., Phillipsburg, N. J.* Bulletin 4179 describes the company's Drillmaster 6½-in. blast hole drill. The bulletin covers three types of mountings—crawler, truck and tractor, and fully explains the new "down the hole" drill. The manufacturer asks that all requests be made on company letterhead and directed to the attention of J. K. Uhler.

**HANDLING EXPLOSIVES.** *Atlas Powder Co., Wilmington 99, Del.* This is a recently revised 4-page list of warnings and instructions on the proper handling and use of explosives. Approved by the Institute of Makers of Explosives, the bulletin is available from the company upon request.

**MINING TOOLS AND BITS.** *Mining Tool Division of Kennametal Inc., Bedford, Pa.* Information on new relief panel design cutter bits; rotary drill, core and drag, roof, open pit and rock bits; pinning rods; augers; drive sockets; adapters; grinders, and grinding wheels are contained in this book. The Kennaset Method of silver brazing Kennametal cemented carbide inserts into milled slots on upset drill steel is reviewed also.

**ORIENTED DIAMOND BITS.** *Sprague & Henwood, Inc., 211 West Olive St., Scranton, Pa.,* Catalog No. 320-1 illustrates and describes all types of oriented diamond coring bits, non-coring bits, casing bits, casing shoe bits, reaming shells, impregnated coring bits, etc. Described in detail is the story of orienting drilling borth in diamond bits.

**PLANT EQUIPMENT.** *McNally Pittsburg Mfg. Corp., Pittsburg, Kans.* Bulletin 855 itemizes a complete line of auxiliary equipment including bearings, takeups, holdbacks, chain, screen plates, pump and valves for coal preparation plants. Also included in specification information on conveyor and drive pulleys, V-belt sheaves, sprockets, gears, shafts and keys. Equipment descriptions are supplemented with photographs, dimension drawings, data tables and specifications.

**PLASTIC COATED WIRE ROPE.** *Macchylte Co., Kenosha, Wis.* Circular No. 5610 contains new specifications and information regarding proper use of plastic coated wire rope. Minimum safety factors, sheave and drum diameters, and tread pressure formulas are also included.

**ROLLER BEARINGS.** *Link-Belt Co., Dept. PR., Prudential Plaza, Chicago, Ill.* Book No. 2658 describes the Link-Belt Company's self-aligning roller bearings. It also gives engineering selection information, complete dimensional specifications and recommended fitting practices.

**RUST PREVENTIVE PAINT.** *Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.* The 28-page general catalog contains information on rust prevention and applications of Rust-Oleum uses and applications throughout industry. Ask for Form 255.

**VIBRATING SCREENS.** *Allis-Chalmers Mfg. Co., 972 S. 70th St., Milwaukee, Wis.* Bulletin 07B8229 describes the company's vibrating screen (Model S) in sizes up to 4 by 10-ft, one, two or three deck, for handling of specification aggregates up to four in. and coal up to six in. In addition to describing screen features, the bulletin also provides procedure for selecting the right type and size of vibrating screen.

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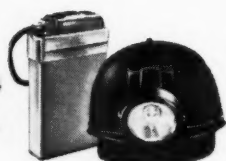
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